AD NUMBER

AD889090

LIMITATION CHANGES

TO:

Approved for public release; distribution is unlimited. Document partially illegible.

FROM:

Distribution authorized to U.S. Gov't. agencies only; Test and Evaluation; 16 NOV 1971. Other requests shall be referred to Army Assistant Chief of Staff for Force Development, Attn: DAFD-OTT, Washington, DC 20310.

AUTHORITY

per oacs for, d/a ltr, 13 sep 1973

(20)

ACTIV

AD 889090

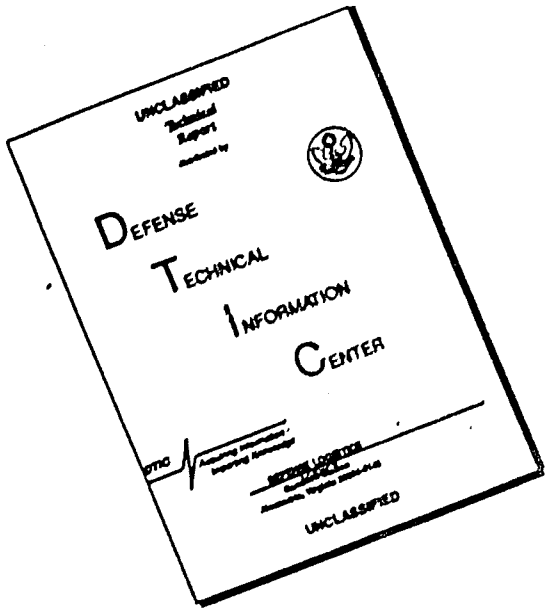
AD No.
DDC FILE COPY

DDC
RECEIVED
NOV 16 1971
C

ARMY CONCEPT TEAM IN VIETNAM
APO SAN FRANCISCO 96384

110

DISCLAIMER NOTICE



THIS DOCUMENT IS BEST QUALITY AVAILABLE. THE COPY FURNISHED TO DTIC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.

DEPARTMENT OF THE ARMY
ARMY CONCEPT TEAM IN VIETNAM
APO San Francisco 96384

FINAL REPORT

FIELD EXPEDIENT SYSTEMS IN USE

BY ARMY AVIATION IN RVN

ACTIV PROJECT No. ACA-38F

Distribution limited to U.S. Gov't. agencies only; Test and Evaluation; 16 NOV 1971. Other requests for this document must be referred to Office of the Assistant Chief of Staff for Force Development, Army Attn: ~~FOR-OT-UT~~, Wash DC 20310 DAFD-OTT.

Approved: 30 SEP 1971

David H. Thomas

DAVID H. THOMAS
Colonel, ADA
Commanding

AVHDO-DO (30 SEP 1971) 1st Ind
SUBJECT: Final Report - Field Expedient Systems in Use By Army Aviation in RVN (ACTIV Project No. ACA-38F)

DA, Headquarters, U.S. Army Vietnam, APO San Francisco 96375 13 NOV 1971

THRU: Commander in Chief, US Army Pacific, APO San Francisco 96558

TO: Assistant Chief of Staff for Force Development, Department of the Army, Washington, D.C. 20310

1. Subject final report is submitted for review and approval.

2. This headquarters concurs in the conclusions and recommendations as written.

3. Request one copy of all forwarding and approval indorsements be furnished this headquarters.

FOR THE COMMANDER:

T. L. CHILDRESS
CPT ACC
ASSISTANT ADJUTANT GENERAL

1 Incl
nc

Copies Furnished:
(See Distribution,
Inclosure 1)

DEPARTMENT OF THE ARMY
ARMY CONCEPT TEAM IN VIETNAM
APO SAN FRANCISCO 96384

IN REPLY REFER TO:

AVIB-CO

30 SEP 1971

SUBJECT: Final Report - Field Expedient Systems in Use By Army Aviation in RVN (ACTIV Project No. ACA 38F)

THRU: Commanding General
United States Army, Vietnam
ATTN: AVHDO-D
APO 96375

TO: Assistant Chief of Staff for Force Development
Department of the Army
Washington, D.C. 20310

1. References:

a. Letter, AGAM-P(M) (2 May 69) FOR ACTIV, Hq DA, 8 May 69, subject: Army Combat Developments and Materiel Evaluation (CD&ME) Program, Vietnam.

b. Letter, AVHGC-DI, Hq U.S. Army, Vietnam, 23 February 1967, subject: Letter of Instructions.

2. In accordance with above references, subject final report is forwarded for review and approval.

3. Request one copy of all forwarding and approval indorsements be furnished this headquarters.

FOR THE COMMANDER:

F. D. LEMUS
1LT, AGC
Adjutant

1 Incl
as (Quin)

Copies Furnished:
(See Distribution, Annex A,
Inclosure 1)

AUTHORITY

Letter, ACSFOR, DA, dated 9 April 1970, subject: Army Combat Developments and Materiel Evaluation (CD&ME) Program, Vietnam FY 71.

ACKNOWLEDGEMENTS

The Army Concept Team in Vietnam acknowledges the following for their cooperation and assistance in the conduct of this study:

1st Cavalry Division (Airmobile)
23d Infantry Division
101st Airborne Division (Airmobile)
US Army Medical Command, Vietnam
1st Aviation Brigade
20th Engineer Brigade

PROJECT OFFICERS

Major Hudson A. Schnell, Field Artillery
Captain Edwin D. Bracken, Corps of Engineers

EVALUATORS

Captain Joel H. Gibson, Infantry
Captain Donald C. Glauthier, Air Defense Artillery

ABSTRACT

During the period 16 December 1970 - 7 April 1971, the Army Concept Team in Vietnam conducted a study of aviation field expedients in use by Army aviation units in the Republic of Vietnam. Field expedients are any non-standard devices produced by a field unit for its own use to improve efficiency or mission performance. These range from weapon systems, special tools, and test sets to procedures that save time and manpower, improve mission performance, and provide the unit a capability that was not previously available.

The study was conducted to accumulate and document the experience of Army aviation units in the Republic of Vietnam, in the use of field expedients, and make recommendations for formal development or procurement of those items which contribute significantly to mission accomplishment, safety, or efficiency of operation. Field expedients of marginal value are also included in this report for the purpose of emphasizing areas where a deficiency exists in presently available equipment.

Conclusions and recommendations are included on individual field expedient reports.

TABLE OF CONTENTS

INDEX OF FIGURES

SECTION I

INTRODUCTION

1. REFERENCES

a. Letter, ACSFOR, DA, dated 9 April 1970, subject: Army CD&ME Program, Vietnam for FY 71 (U).

b. TM 55-1510-202-20, Organizational Maintenance Manual: Army Models O-1A, O-1A(IT), 10 December 1968.

c. TM 55-1510-205-20, Organizational Maintenance Manual: Army Model U-1A Aircraft, 7 July 1965.

d. TM 55-1520-209-20, Organizational Maintenance Manual: Army Model CH-47 Helicopter, 23 May 1968.

e. TM 55-1520-210-20, Organizational Maintenance Manual: Army Model UH-1D/H Helicopter, 7 May 1969.

f. TM 55-1520-221-20, Organizational Maintenance Manual: Army Model AH-1G Helicopter, 30 April 1969.

g. TM 55-1520-228-35, DS, GS and Depot Maintenance Manual: Army Model OH-58A Helicopter, 7 October 1970.

2. BACKGROUND

a. Since 1965, when US Army aviation began a buildup in the Republic of Vietnam (RVN) to meet the increased enemy threat, field expedients have been devised by practically every US Army aviation unit to improve its capability to perform the assigned mission. Some field expedients could be categorized as important to the successful performance of the mission, others to facilitate mission performance by increasing efficiency, and the remainder were in the "nice-to-have" category.

b. Some field expedients adopted by individual units were later put into general use throughout the US Army. Other field expedients were dangerous and contributed to accidents resulting in destruction of government property and casualties. The majority of field expedients were never documented to permit general application; therefore, the cataloging of as many as possible was the primary objective of this evaluation.

3. DESCRIPTION

For the purpose of this report a field expedient is defined to be any non-standard device produced by a field unit for its own use to improve efficiency or mission performance. Some expedients were designed due to the shortage of adequate equipment, some to improve safety aspects, while others are used to

make the aviators more comfortable when accomplishing their missions. These range from weapon systems, special tools, and test sets to procedures that save time and manpower and improve mission performance. Frequently these expedients provide the unit a capability that could not be obtained otherwise.

4. PURPOSE

The purpose of this evaluation was to accumulate the experience of Army aviation units in RVN in the use of field expedients, to determine the military worth and general applicability of such items, and recommend formal development or procurement of those items which contribute significantly to mission accomplishment, safety, or efficiency of operation.

5. OBJECTIVES

a. Documentation. To document field expedients used by aviation units in RVN.

b. Effectiveness. To determine the effectiveness and military worth of aviation field expedients in RVN.

c. Additional Applications. To determine general or special applications of field expedients to aviation units having the same or similar missions, and to provide guidance to the research and development community for development of future materiel and doctrine.

6. SCOPE

The scope of the evaluation included aviation units which were active in RVN during the period of data collection, January through April 1971.

7. METHOD OF EVALUATION

a. General

(1) A library search of Operational Reports-Lessons Learned revealed no field expedients of significant value were recorded.

(2) Army aviation units in RVN were requested to identify and provide the location of any aviation field expedients in use within their command. As part of the data collection effort the ACTIV project officers visited the location of the expedients identified, and photographed and documented them. During the data collection phase the project officers were alert for any additional aviation field expedients.

(3) During the initial unit contact, it was emphasized that this evaluation had no connection with armed services suggestion programs; any desired recognition of an individual's contribution to a field expedient

system was to be pursued by the individual through established channels. It was also pointed out that ACTIV's final report would preserve the anonymity of both the designer and the unit.

(4) Field expedients of marginal value were also included in the evaluation for the purpose of emphasizing areas where a deficiency still exists in presently available equipment. The field expedients were identified by aircraft type and were examined individually to determine their effectiveness and military worth. A standard format was developed for the presentation of information on each field expedient.

b. Format of the Catalog of Field Expedients

The information on each field expedient in section II of this report is arranged as follows:

(1) Purpose/Problem - identification of the factors which caused this expedient to be developed.

(2) Description/Discussion - sufficient information to describe the expedient and comment on factors of performance, cost, maintenance, safety, support and/or manhours required for fabrication and applicability to other aircraft.

(3) Conclusions and Recommendations.

c. Criteria

(1) The cost of each expedient was evaluated, in so far as possible, with respect to costs for materials, installation, operation, maintenance, and manpower required for fabrication. The contribution of the expedient to mission accomplishment was quantitatively evaluated where possible. In the absence of quantitative data, a qualitative determination was made on the basis of the new capability provided by the expedient. Expert opinion of users, evaluators, and project personnel were used in the absence of explicit data.

(2) The wide variation in types of field expedients examined and the difficulties inherent in comparing these widely varying types, precluded the establishment of fixed value measurements or determination of criteria of relative military worth.

8. ENVIRONMENT

The evaluation took place in Military Regions (MR) 1, 2, 3 and 4 during the period January through April 1971.

SECTION II

CATALOG OF FIELD EXPEDIENTS

1. HELICOPTER, UTILITY/ATTACK

a. AS 1703/AR Antenna Mount (UH-1H)

(1) Purpose/Problem

To strengthen the VHF/FM antenna mount and prevent cracking. The original VHF/FM mount was cracking between 50 and 100 hours flying time.

(2) Description/Discussion

An antenna mount is fabricated using 40-gauge sheet metal rather than the usual 20-gauge. Bolts are used instead of rivets to attach the mount to the vertical fin (see figures II-1 and II-2). The basic design of the mount is not changed. The 40-gauge mount has been flown more than 1200 hours without cracking. A direct support metal shop is required to install the 40-gauge mount. Approximately 12 man-hours are required. The mount is applicable to all UH-1 aircraft with the VHF/FM antenna located on the vertical fin.

(3) Conclusion and Recommendations

(a) Conclusion

The antenna mount constructed from 40-gauge sheet metal has a maintenance-free service life 10 times greater than that of the standard mount and causes no change in aircraft performance or configuration.

(b) Recommendations

1. All new UH-1H aircraft be procured with a more durable antenna mount.

2. The cognizant agency publish a modification work order (MWO) to install 40-gauge mounts on UH-1 helicopters in the field.

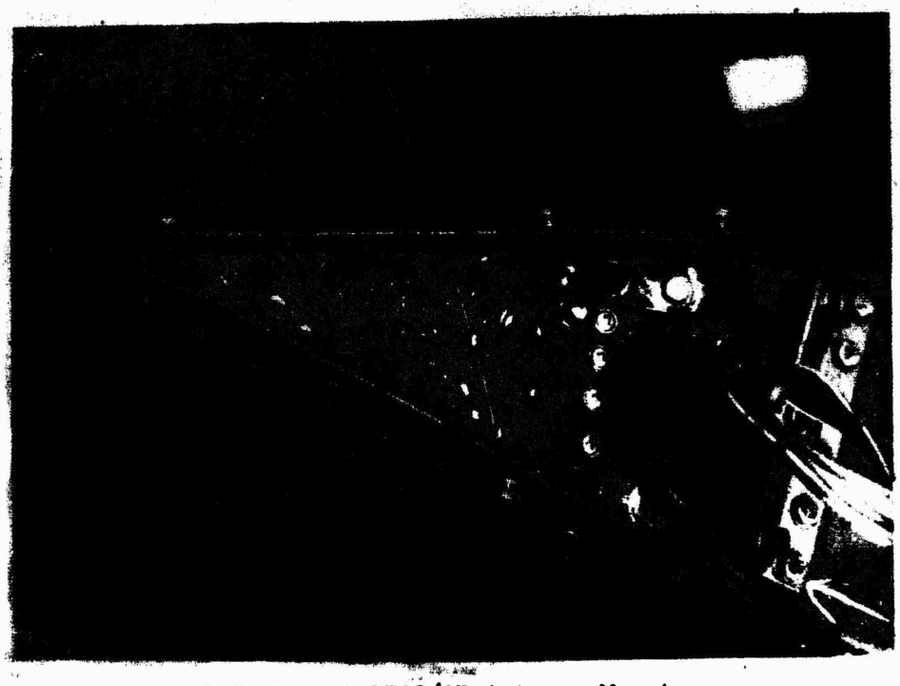


FIGURE II-1. AS 1703/AR Antenna Mount.

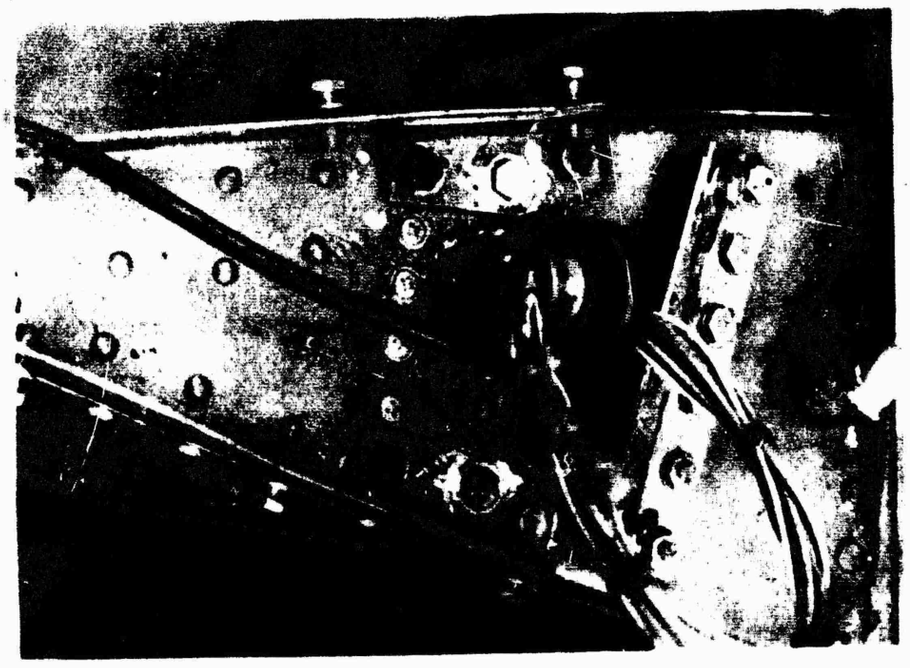


FIGURE II-2. AS 1703/AR Antenna Mount.

b. Storage Bin (UH-1D/H)

(1) Purpose/Problem

To provide a bin for storage of flight gear and weapons carried on the aircraft where no provisions are available for securing the equipment, and to secure mission equipment during flight with the cargo doors in the open position. The storage bin reduces the tendency for crew members to store miscellaneous items in the electrical compartment located under the engine compartment and reduces the hazard of loose articles flying out of the aircraft and into the rotor systems.

(2) Description/Discussion

A standard wooden foot locker is mounted in the gunner's well, replacing the fire-resistant troop seat normally mounted in that position (see figure II-3). The foot locker is secured to the cargo floor using the three cargo tie down rings located along the buttock line 18.00, and stations 181.50, 147.00 and 159.50. The standard seat rod, from the troop seat normally mounted in the gunner's well, is used to secure the foot locker to the cargo floor. The seat rod is inserted through the tie down ring located at station 131.50, through a hole drilled in the side of the foot locker 2.5 inches from the back, and 1/4-inch up from the bottom, and then through the tie down ring located at station 147.00. An additional hole in the opposite end of the foot locker allows the seat rod to exit at the other end for attachment to the tie down ring located at station 159.50. The hinges and hasp normally installed on the foot locker are retained, with the top being used as a seat. No cost was incurred, since the foot lockers were obtained at property disposal units, and the seat rod is standard equipment. Approximately one manhour is required to fabricate and install the expedient. The expedient is applicable to the UH-1D or H model aircraft only.

(3) Conclusions and Recommendation

(a) Conclusions

1. The device provides storage bins that are otherwise not available.

2. Loose equipment can be secured in the bin, and the danger of articles flying out of the aircraft or into the rotor systems is reduced.

3. The foot locker does not provide the fire resistant qualities of the standard seat.

(b) Recommendation

A container type seat with fire resistant properties be developed by the cognizant agency.

FIGURE II-3. Storage Bin, UH-1.

c. Drain Tube for 42° and 90° Gear Boxes (UH-1)

(1) Purpose/Problems

To prevent spillage of oil from the 42° and 90° gear boxes when draining oil during maintenance inspections. When draining oil from the 42° and 90° gear boxes, the oil flows down the tail boom and vertical fin, saturating the rivets. During flight the vibration causes the rivets in this area to move about in their holes. Over a period of time, major repair work on the tail boom is often necessary to correct damage.

(2) Description/Discussion

The drain tube is mounted to the gear box by altering a magnetic plug by removing the center plug, inserting a tube into the center of the magnetic plug, and flangeing the tube on the inside of the plug (see figures II-4 and II-5). Aircraft mechanics are capable of fabricating the expedient using the following items: Tubing, Aluminum, 1/4-inch, Chip Detector, Magnetic, (FSN 4730-690-3926, or FSN 1615-918-1893). When properly mounted, the plug can be left in place during the flushing of the gear boxes, allowing the oil to drain away from the tail boom with no spillage (see figure II-6). Parts utilized in the fabrication of this expedient are obtained from salvage material, resulting in minimal cost to the government. One manhour is required to construct the expedient. The drain tube for the 42° and 90° gear boxes can be used on all helicopters requiring similar servicing. The possibility of injuries resulting from slipping on spilled oil is also decreased.

(3) Conclusion and Recommendation

(a) Conclusion

The drain tool reduces sheet metal work required to replace rivets on the tail boom and vertical fin, and reduces the possibility of injuries resulting from slips on spilled oil.

(b) Recommendation

A standard drain tube for the 42° and 90° gear boxes be developed.

FIGURE II-4. Drain Tube For Gear Boxes (UH-1).

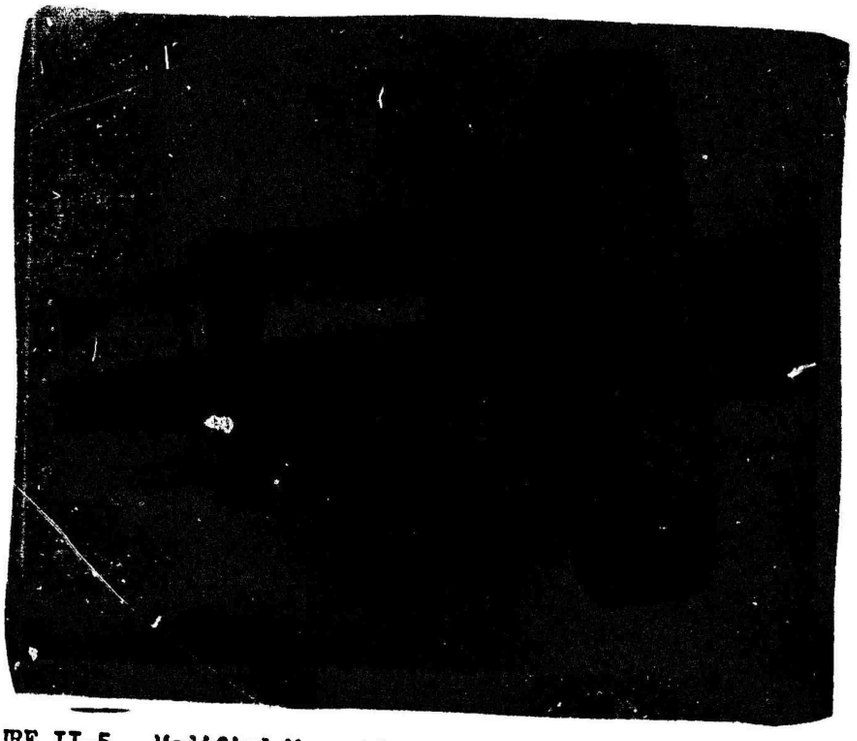


FIGURE II-5. Modified Magnetic Plug For Drain Tube.

FIGURE II-6. Drain Tube Installed.

d. Crew Positions (UH-1D/H)

(1) Purpose/Problem

To improve stability of the aircraft. When the gunner and crew chief are in their normal positions, the center of gravity varies considerably with different types of loads. When troops are rapelling, the expedient configuration allows the aircraft to be brought to a stable hover while the troops descend. The method is applicable to UH-1D or H model aircraft.

(2) Description/Discussion

A standard, one-man troop seat assembly (FSN 1680-895-9339) has been mounted at buttock line 22.50, and stations 78.14 and 93.15. Standard seat attaching points are used for the rear legs of the seat (see figure II-7). The front legs are secured with safety wire to the cargo tie down rings located at the buttock lines 39.50 and 43.50, and stations 78.14 and 39.15. The ammunition for the door gun is mounted in front of the seat below the gunner's legs. By placing the two crew members forward, the center of gravity remains relatively constant; thus the greater weight of the cargo can be positioned directly under the main rotor mast. This also improves the hovering characteristics of the UH-1 with full fuel loads. With CG forward, the aircraft can be hovered in a nose low attitude, which keeps the skids level and provides additional tail clearance. Crew chief and door gunner have better forward visibility for aircraft clearance and fields of fire. Using the standard seat, no cost is incurred. A safety hazard exists because the door gun is hand-held with nothing to limit its movement. Rounds expended by the weapons could be directed into the airframe or rotor system. In addition, the seat is attached to the aircraft using standard attachment mounts at only two points. The seat may not remain in place during accidents or abrupt maneuvers.

(3) Conclusion and Recommendation

(a) Conclusion

The expedient appears useful; however, the method of seat installation required by the expedient endangers the door gunner and crew chief in the event of an accident. The expedient is also hazardous to the aircraft because hand-held weapons do not have deflection and elevation stops to prevent firing into the airframe or rotor system. Modification of the M-23 armament subsystem mount assembly would be required to limit weapon travel.

(b) Recommendation

That the expedient be further developed by the cognizant agency with a view toward adequately anchoring the seat and eliminating the hazards of the seat not remaining in place, and the hazards of the unrestrained hand-held weapon.

FIGURE II-7. Gunner's Seat (UH-1)

e. Access Panel for Right Lower Door Hinge (UH-1)

(1) Purpose/Problem

To permit faster and easier replacement of right lower door hinge on UH-1 aircraft. This expedient performs an entirely new function. Replacement of this door hinge as prescribed by the TM 55-1520-210-20 (reference I-1e) necessitates removal of the chin bubble which requires 3.5 to 4 manhours.

(2) Description/Discussion

A 3 by 3-inch square is cut in the skin one inch behind the chin bubble and one inch below the right lower door hinge. A 3.5- by 3.5-inch cover panel is cut from 1/8-inch sheet metal. Eight nutplates are installed on the aircraft to secure the panel. Maintenance personnel with sheet metal experience are required to fabricate the access panel. Approximately 2 manhours are required to install the access panel. This expedient is applicable to UH-1 helicopters only. Once the expedient is installed, the time needed to replace the door hinge is reduced to approximately 15 minutes.

(3) Conclusion and Recommendations

(a) Conclusion

This access panel greatly reduces maintenance manhours and aircraft downtime.

(b) Recommendations

1. This access panel be installed on UH-1H aircraft by the manufacturer.

2. The cognizant agency publish a MWO for installing the access panel on the UH-1H helicopters in the field.

f. T-53 Engine Special Tools (UH-1H)

(1) Purpose/Problems

To reduce the time required for T-53 engine maintenance:

(a) A tool was fabricated to remove Allen screws located under the rear bearing cover on the hot-end. The tool permits the use of a ratchet, rather than the standard Allen wrench (see figure II-8).

(b) Another tool was fabricated to remove the Allen screws on the top half of the compressor housing (see figure II-9). The tool reduces the maintenance time required to remove the hot-end and compressor cover by 50 percent.

(c) Using the standard ratchet issued with the general mechanic's tool set, the time required to remove the hot-end is approximately 12 manhours.

(2) Description/Discussion

(a) The rear bearing cover tool is constructed by welding a 3/16- by 1/4-inch drive socket to a 3/16-inch Allen wrench to remove the engine hot-end.

(b) The compressor cover removal tool is constructed from a 7/32-inch Allen wrench welded to a 3/16- by 1/4-inch drive socket, to permit use of a ratchet. The tools can be used on Allen screw sizes 3/16-inch or 7/32-inch.

(c) Minimal costs are incurred for the tools described above and one manhour is required for welding.

(3) Conclusion and Recommendation

(a) Conclusion

The tools reduce the time required to remove the engine hot-end and the compressor section upper cover.

(b) Recommendation

A complete set of Allen wrenches, adaptable to ratchet wrenches, be included in the aircraft mechanic's general tool set.

FIGURE II-8. T-53 Engine Special Tool.

FIGURE II-9. T-53 Engine Special Tool.

g. Pitch Change Link Preset Jig (UH-1C/H)

(1) Purpose/Problem

To preset main roter and tail rotor pitch change links prior to installation on the aircraft. Both main rotor and tail rotor pitch change links are set on this jig. This method is faster and more accurate than measuring with a ruler.

(2) Description/Discussion

The jig base is 1/4-inch flat aluminum plate. The alignment pins are bolts with the bolt heads removed (see figure II-10). The alignment pins are machined to the same diameter as the pitch change link rod end bearings. The pins are installed on the base at prescribed lengths as found in TM 55-1520-210-20 (reference I-1e) (see figure II-11). The pitch change links are adjusted until they fit on the proper pins to establish the precise length prior to installation. The links are then installed on the aircraft and normal blade tracking procedures prescribed in TM 55-1520-210-20 are followed. This jig guarantees equal length of both pitch change links. UH-1C main rotor links have a larger diameter rod end bearing. Adapters are machined to slip over the alignment pins and accept these links. A demonstration is necessary before personnel can properly use the jig. By using scrap material cost of fabrication is negligible. This pitch change link jig is applicable to the UH-1C and the UH-1H aircraft.

(3) Conclusion and Recommendation

(a) Conclusion

This jig permits fast and accurate adjustment of pitch change links prior to installation on the aircraft.

(b) Recommendation

This jig be developed by the cognizant agency and issued to units using the UH-1 aircraft.

FIGURE II-10. Pitch Change Link Length Jig (UH-1D, H).

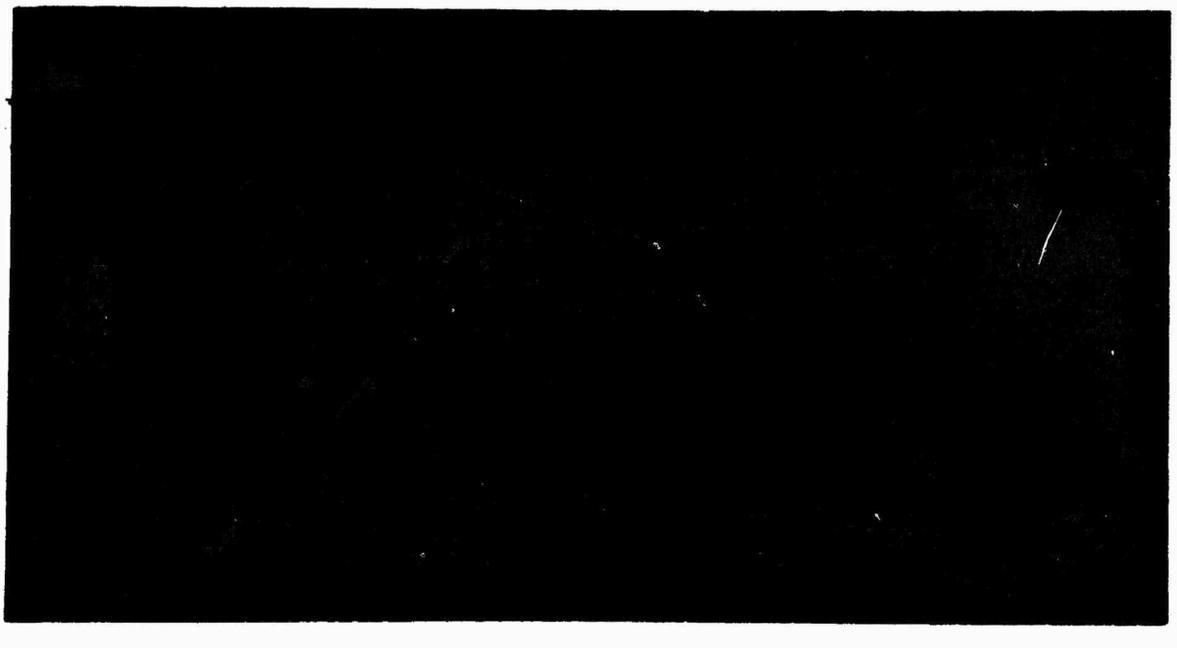


FIGURE II-11. Pitch Change Link Length Jig (UH-1D, H)

h. Pitch Change Link Length Jig (UH-1D/H)

(1) Purpose/Problem

To provide a ready reference for setting the approximate length of pitch change links without measuring each individual link (see figure II-12). The jig is used to determine approximate length without removing the pitch change link to measure it with a ruler, as prescribed in TM 55-1520-210-20 (reference I-1e). The jig allows maintenance personnel to adjust the UH-1D and UH-1H pitch change links to approximate length while the universal end remains attached to the stabilizer bar mixing lever. The jig is primarily used in performing a quick change of main rotor blades at field locations.

(2) Description/Discussion

The pitch change link is constructed using 1/8-inch sheet metal cut as illustrated in figure II-13. The overall length of this tool is 7.5 inches, with a 1/2-inch protrusion, 1/5-inch wide at the top. A concave curve is cut, starting one inch at the top and ending 4 inches from the bottom. The curve has a maximum depth of 3/5-inch. This expedient can be constructed from scrap sheet metal, and no cost is incurred. Newly assigned personnel are qualified to use expedient after a short briefing. Approximately 1.5 manhours is required to construct this jig. The expedient is applicable to both the UH-1D and UH-1H aircraft.

(3) Conclusion and Recommendation-

(a) Conclusion

The pitch change link length jig saves time by providing maintenance personnel with a quick reference for setting pitch change link lengths without removing the link completely from the rotor head assembly.

(b) Recommendation

Sufficient information be disseminated to all aviation units equipped with UH-1D and UH-1H aircraft to enable fabrication of the item.

FIGURE II-12. Pitch Change Link Length Jig (UH-1D, H).

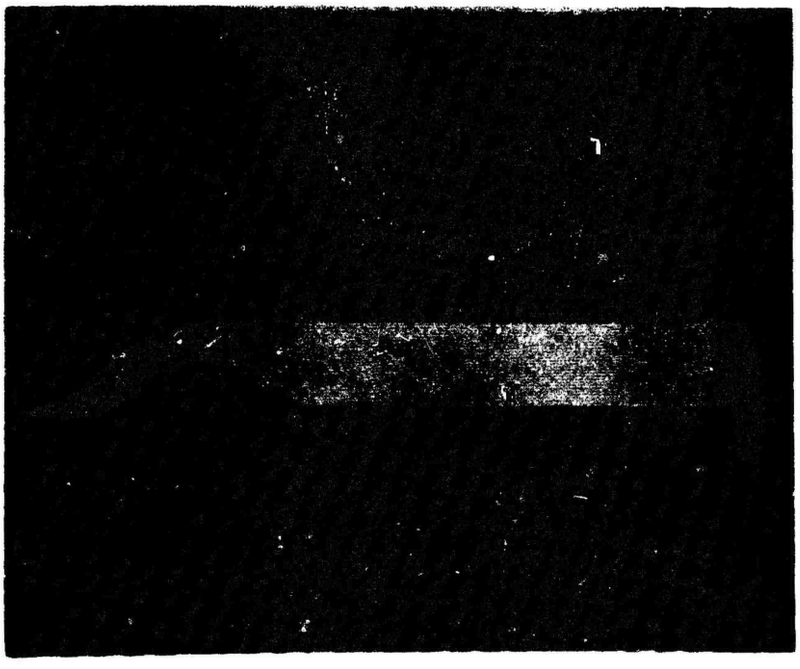


FIGURE II-13. Pitch Change Link Length Jig (UH-1D, H).

1. Synchronized Elevator Drag Adjustment (UH-1 and AH-1G)

(1) Purpose/Problem

To determine, by use of solder, the size of shims required to set the synchronized elevator drag on UH-1H and AH-1G aircraft. The solder expedites determination of the correct shim size to be used for installation on the synchronized elevator.

(2) Description/Discussion

The procedure in TM 55-1520-210-20 (reference I-1e) for installation of synchronized elevator shims (FSN 5340-067-9743) requires the successive adjustment of the support retainer clamp to determine size of shim needed. By placing wire solder between the support retainer clamp and tightening until the required drag is produced, the correct size can be determined in one operation (see figure II-14). By removing and measuring the thickness of the solder, the correct size shim is determined. The cost of the solder is negligible. This procedure can be followed on all UH-1 and AH-1G aircraft.

(3) Conclusion and Recommendation

(a) Conclusion

Use of this expedient method reduces the time required to perform a prescribed maintenance function.

(b) Recommendation

TM 55-1520-210 be changed to prescribe the use of solder to determine the shim size required for setting the synchronized elevator drag on UH-1 and AH-1G aircraft.

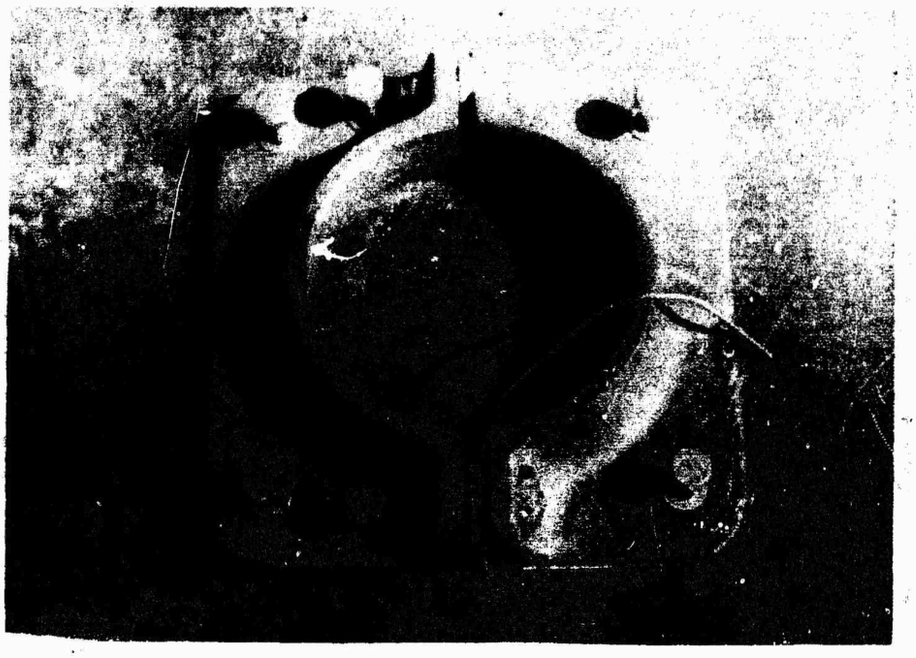


FIGURE II-14. Synchronized Elevator Drag Adjustment (UH-1, AH-1).

J. Tail Rotor Hanger Bearing Grease Packing Tool (UH-1H)

(1) Purpose/Problem

To pack grease in tail rotor hanger bearings in a quicker and more precise manner. Packing by hand sometimes results in using too much grease or packing the bearing unevenly.

(2) Description/Discussion

The packing tool is machined from plastic stock. The cylinder is formed and the plastic extension is bonded to it (see figure II-15). After removing the hanger bearing from the aircraft grease is placed in the bearing, then the tool is inserted and rotated 360 degrees to pack the grease to the required depth and remove any excess grease. See figure II-16 for the UH-1H hanger bearing and packing tool. To pack one bearing by hand takes approximately 5 minutes. Using the packing tool, it takes less than 1 minute. A demonstration is necessary before personnel can properly use the tool. No cost is incurred as the tool is fabricated from scrap materials. With different dimensions, the packing tool could be used on any helicopter with hanger bearings. A similar tool could be developed to pack short shafts.

(3) Conclusion and Recommendation

(a) Conclusion

This tool saves time and increases accuracy in packing tail rotor hanger bearings.

(b) Recommendation

Sufficient information be disseminated to aviation units to enable fabrication of the expedient.

FIGURE II-15. Tail Rotor Hangar Bearing Packing Tool (UH-1H).

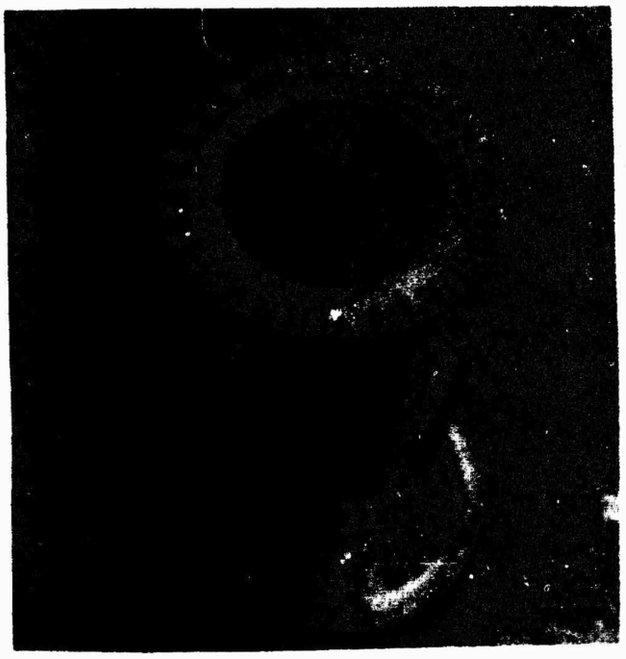


FIGURE II-16. Tail Rotor Hangar Bearing Packing Tool (UH-1H).

k. Tail Rotor Quill and Rod Assembly Tool (UH-1, AH-1G)

(1) Purpose/Problem

To hold the tail rotor pitch change quill (FSN 1615-624-6956) while tightening the quill retaining nut (FSN 1615-674-4233). In the past, the assembly had to be removed from the aircraft. With this expedient the procedure can be accomplished with the assembly mounted on the aircraft.

(2) Description/Discussion

A tail rotor pitch change chain (FSN 1615-624-6963) is cut to a four-inch length. Tubular handles are attached to both ends by the use of rivets (see figure II-17). The chain is mounted on the quill sprocket and the handles are then moved together to restrict the rotation of the quill. Torque can then be applied without removal and replacement of the assembly. The tool is constructed from a scrap pitch change chain, so no cost is incurred. Approximately one manhour is required to assemble the tool. The tool can be used on all UH-1 and AH-1G aircraft.

(3) Conclusion and Recommendation

(a) Conclusion

The tool provides a means to restrict movement of the tail rotor pitch quill when tightening the quill retaining nut, without the necessity of removing and replacing the assembly, thus reducing maintenance time.

(b) Recommendation

Sufficient information be disseminated to all aviation units to enable fabrication of the expedient.

FIGURE II-17. Tail Rotor Quill and Rod Assembly Tool (UH-1, AH-1).

1. Transmission Hoist (UH-1H)

(1) Purpose/Problem

To provide a capability to remove major aircraft components such as the main rotor head and the transmission from UH-1 aircraft. The expedient was designed due to the shortage of a wrecker to remove major aircraft components.

(2) Description/Discussion

A 4-inch cast iron pipe with attachments for lifting air-components was formed and attached to the lift forks of a 6000-pound fork lift (see figure II-18). The device can be attached to a variety of fork lifts (see figures II-19, II-20 and II-21). Cost includes cast iron pipe and approximately 6 Manhours to construct. The hoist can be adapted to any type fork lift, but is restricted in movement since the fork lift must be repositioned when lateral movement is desired.

(3) Conclusion and Recommendation

(a) Conclusion

The hoist is not a suitable or safe replacement for the wrecker, since lateral movement is restricted.

(b) Recommendation

The use of the expedient be discontinued or be further developed to ensure safety and versatility.

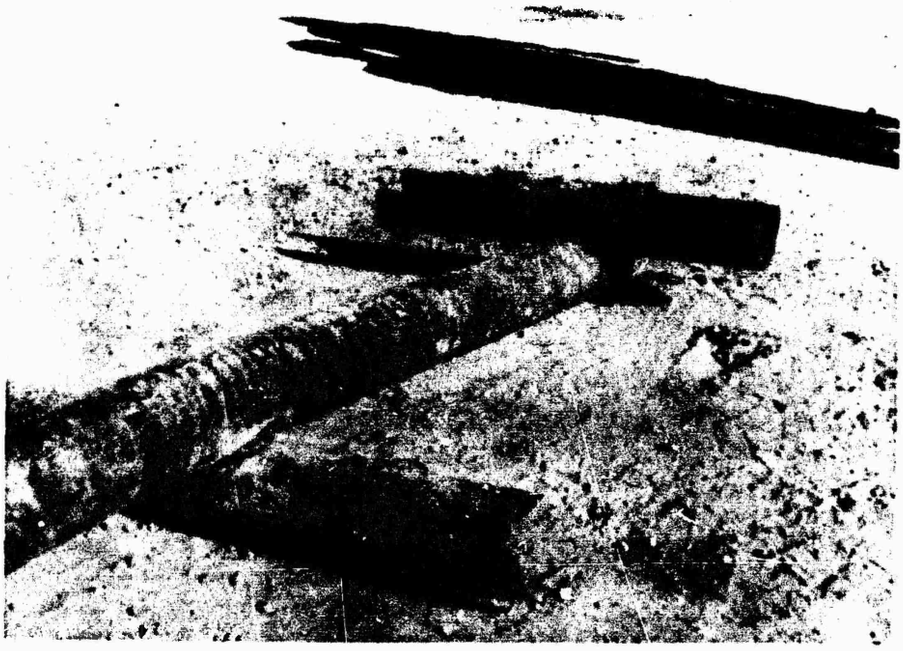


FIGURE II-18. Transmission Hoist.

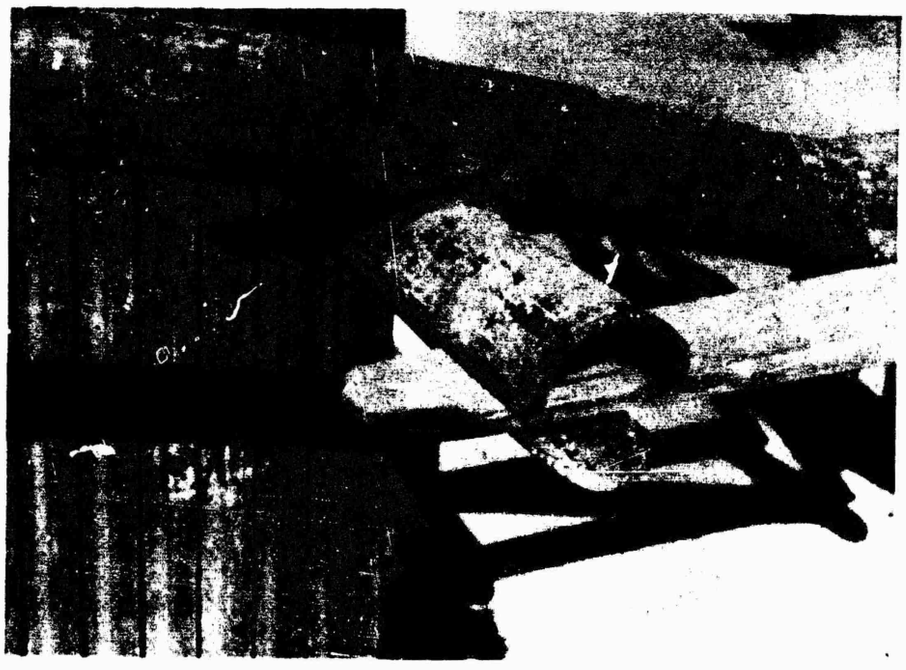


FIGURE II-19. Transmission Hoist (UH-1H).

FIGURE II-20. Transmission Hoist (UH-1H).

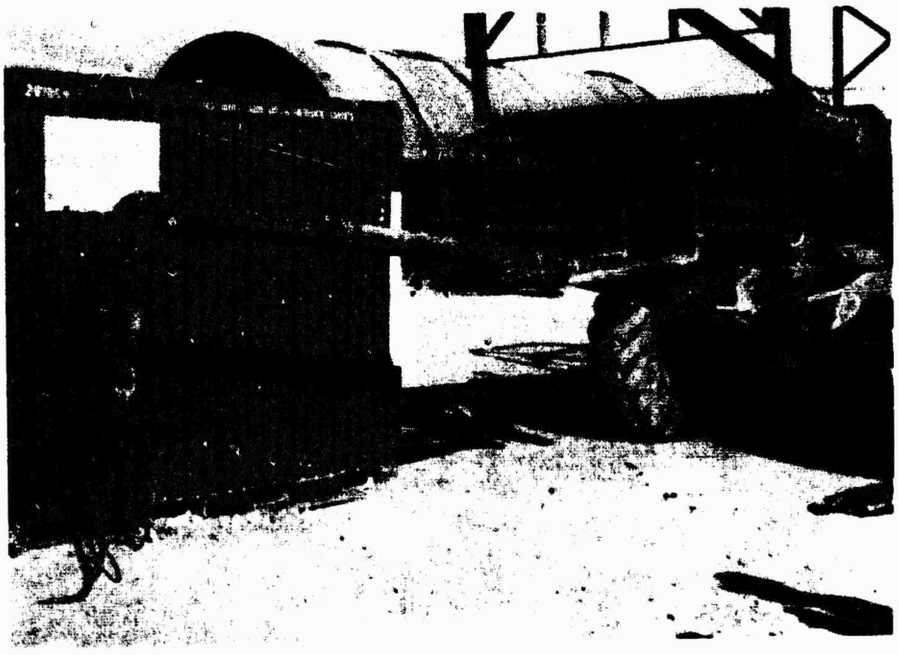


FIGURE II-21. Transmission Hoist (UH-1H).

m. Window Lock (UH-1)

(1) Purpose/Problem

To provide a locking device for the pilot and copilot door windows. The standard screw lock does not provide sufficient friction to insure physical security of the helicopter or its contents when parked unattended.

(2) Description/Discussion

A bolt one inch in length is inserted into a 1/4-inch hole drilled in the bottom of the plexiglass window while the window is in the up position (figures II-22 and II-23). A standard cargo door safety pin is installed in the end of the bolt to prevent extraction. Cost includes the bolt, one safety pin and approximately 1/2-manhour to install the window lock. The device can be used on any aircraft equipped with a slide-type window.

(3) Conclusion and Recommendation

(a) Conclusion

The expedient provides a means of locking the cockpit slide windows.

(b) Recommendation

Sufficient information be disseminated to all aviation units to enable fabrication of the expedient.

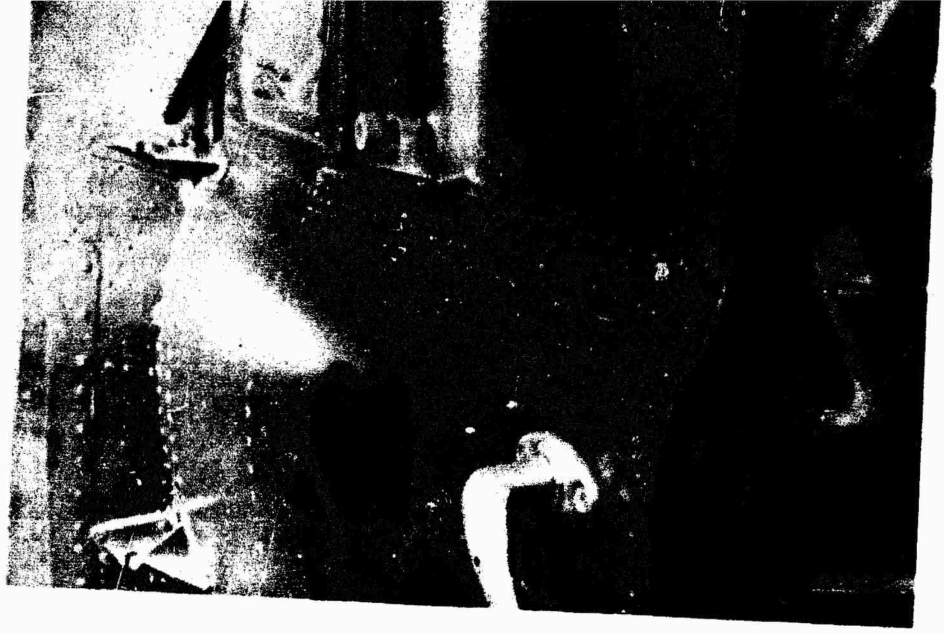


FIGURE II-22. Window Lock (UH-1).

FIGURE II-23. Window Lock (UH-1).

n. Main Rotor Blade Retaining Pin Aligning and Extracting Tool (UH-1, AH-1 and OH-58)

(1) Purpose/Problem

To extract the main rotor blade pins and to align the holes in which the retaining pin is inserted. In the past, without the use of the tool, mechanics have damaged many pins, blades and hubs when attempting to drive the retaining pin into place (see figure II-24).

(2) Description/Discussion

Total length of this expedient is 4 1/2 inches. Its maximum diameter is 2 1/2 inches tapering in a cone shape to a minimum diameter of 1/2 inch. This expedient is applicable to all UH-1 and AH-1G aircraft. When extracting the retaining pin, the tool is placed on the threaded end of the pin and by lightly striking the narrow, blunt end of the tool, the pin is removed without damaging the threads on the pin. When inserting the retaining pin, the alignment is automatically completed as the taper of the tool pulls the holes into place. A similar tool can also be used on the OH-58 aircraft but the maximum diameter should be 1 1/2 inches and tapering to a minimum diameter of 1/4 inch. The base of the tool is drilled until the base of the cone seats on the shank of the pin. One manhour is required to machine the tool. Cost is minimal.

(3) Conclusion and Recommendation

(a) Conclusion

The tool allows fast, efficient installation and removal of the main rotor blade retaining pins and reduces possibility of damage to pins, blades and hubs.

(b) Recommendation

Such a tool be developed and included in the aircraft mechanic's general tool set.

FIGURE II-24. Main Rotor Blade Retaining Pin Aligning and Extracting Tool (UH-1, AH-1, OH-58).

o. Spline Holding Fixture (UH-1, AH-1G)

(1) Purpose/Problem

To hold the short shaft in place on the work bench during disassembly (see figure II-25). During the disassembly of the short shaft for repacking grease, the splined ends sometimes becomes damaged and the entire short shaft must be replaced.

(2) Description/Discussion

The base is 1/4-inch flat steel 11 inches long, 2 inches wide and welded to a scrap section of a short shaft. After assembly the holding fixture is placed into a bench vise for use. With the use of the expedient, the splined end not being worked-on is protected and at the same time, the end being worked-on can have the proper torque applied before starting on the end being protected. Cost includes the flat steel and approximately one manhour to assemble the expedient by welding. This expedient is applicable to all UH-1 and AH-1G aircraft.

(3) Conclusion and Recommendation

(a) Conclusion

The expedient prevents the possibility of damaging the splined ends of the short shaft during assembly or disassembly.

(b) Recommendation

Sufficient information be disseminated to aviation units to enable assembly of the expedient.

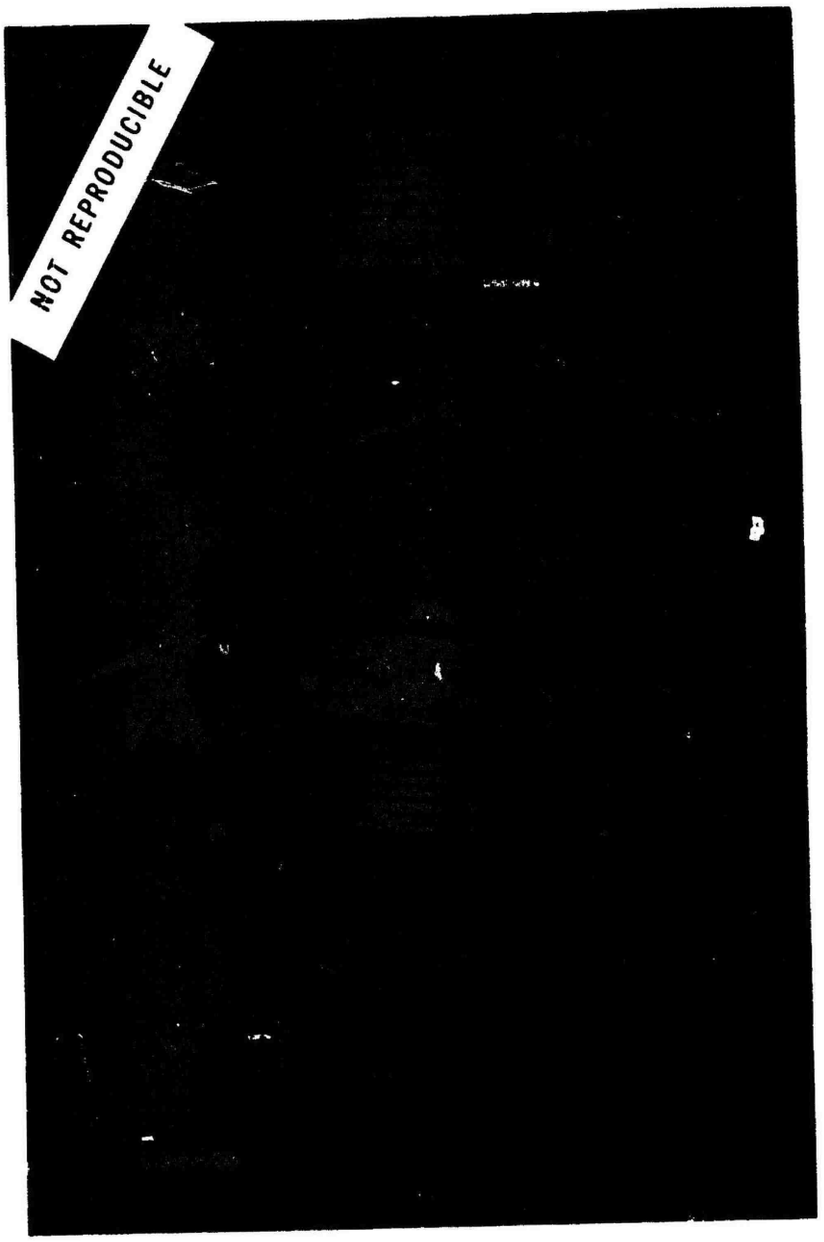


FIGURE II-25. Spline Holding Fixture (UH-1).

p. Input Quill Installation Tool (UH-1, AH-1G)

(1) Purpose/Problem

To force-fit the input quill into the transmission without having to "deep freeze" the input quill or heat the transmission (see figure II-26). The "deep freeze" process involves approximately 12 hours of cooling the input quill before installation. This process has a tendency to make the seals very brittle and after installation the input quill leaks and must be removed.

(2) Description/Discussion

Two end plates from the engine output shaft are welded to an automotive jack turn-screw. Fully extended it is 14 3/4 inches long, contracted 9 1/2 inches (see figure II-27). To use this expedient the input quill is first inserted into the transmission, next the installation tool (modified jack turn-screw) is placed between the aircraft engine and input quill, then by turning the turn-screw slowly clockwise the quill is forced into its proper place.

(3) Conclusions and Recommendation

(a) Conclusions

1. The tool expedites the installation of the input quill without damaging the input quill seal.

2. Reduces manhours from the normal 12 hours to 2 hours for changing an input quill.

(b) Recommendation

Sufficient information be disseminated to all aviation units to enable fabrication of the expedient.

FIGURE II-26. Input Quill Installation Tool (UH-1).

FIGURE II-27. Input Quill Installation Tool (UH-1)

q. Void Hammer (UH-1, AH-1G, OH-58)

(1) Purpose/Problem

To locate a weak spot or a void in honeycomb areas located in the main rotor, tail rotor, or a weak spot in the engine deck panel and transmission wall panels. Before the expedient was designed the voids were located by the use of a wrench, a cigarette lighter or a ball peen hammer which in some cases resulted in breaking the skin over the honeycomb area.

(2) Description/Discussion

The total length of the tool is 8 1/2 inches. The handle is 4 1/2 inches long, hammer head is 1 3/4 inches long and 1/2-inch in diameter. A 1/4-inch stainless welding rod 3 5/8 inches long connects the hammer head to the handle (see figure II-28). As the hammer strikes the panels with no voids the response will be a solid sound but when striking a void the hammer produces a vibrational sound. Due to the light weight of the void hammer the possibility of breaking the skin is decreased. Cost is minimal as the material used is scrap stock and requires 1 1/2 manhours to construct. This expedient can be used on any aircraft equipped with honeycomb panels.

(3) Conclusion and Recommendation

(a) Conclusion

The expedient is a quick, reliable means of locating a void in a honeycomb area.

(b) Recommendation

Sufficient information be disseminated to all aviation units to enable assembly of the tool.

FIGURE II-28. Void Hammer (UH-1).

r. Torque Meter Test Set (UH-1, AH-1G)

(1) Purpose/Problem

To verify the accuracy of the torque meter located on the aircraft instrument panel. This indicator is connected to a transmitter which is part of the engine oil system. The torque meter indicates torque pressure in pounds persquare inch (psi) of torque imposed upon the engine output shaft. The torque meter test set is connected directly to the engine oil system; thus the torque meter set receives the psi reading simultaneously with the torque meter in the aircraft. The calibration on the torque meter test set should verify the reading of the torque meter installed in the aircraft.

(2) Description/Discussion

The torque meter test ste consists of a standard pressure line, 1/4-inch, stock number 204-060-579-1, one "T" fitting, and one torque meter FSN 6620-179-1886, (see figure II-29). Cost is minimal. Approximately 1/2 manhour is required to assemble the test set. The test cable can be used on all aircraft equipped with the turbine engine if the torque meter on the test cable is the same as that of the aircraft being checked.

(3) Conclusion and Recommendation

(a) Conclusion

The expedient serves to verify calibration of the installed torque meter.

(b) Recommendation

Sufficient information be disseminated to all aviation units to enable assembly of the test set.

FIGURE II-29. Torque Meter Test Set (UH-1).

s. Modified Mini-Gun System (Nighthawk)(UH-1H)

(1) Purpose/Problem

To increase the ammunition capacity of the Nighthawk system aboard the UH-1H. The standard Nighthawk has a capacity of 1500 rounds.

(2) Description/Discussion

The Nighthawk system consists of a starlight scope for target acquisition, a searchlight for target illumination, and a mini-gun for target engagement. The modified mini-gun system has an 8000 round capacity compared to the original 1500 round capacity. Two modifications were performed to improve mini-gun capacity: The ammunition box and drum were adapted from the XM28 weapon system (see figure II-30). This provides two separate ammunition receptacles which are not interconnected. The weapon is fed through two ammo feed chutes. The ammo feed chutes were lengthened in order to reach the mini-gun (see figure II-31). The following component part information is provided: box assembly, ammo, 7.62mm (FSN 10900772103; cost-$960), box assembly lid (FSN 1098265348; cost-$266), box assembly crossover feed (FSN 10908265439; cost-$1672), 7.62 ammo drum (FSN 1005404745l; cost-$4557), ammo feed chute (cost-approximately $200). Total cost is approximagely $7655.00. The mini-gun fires the ammunition from either the box or the drum, using the modified feed chute. When the ammunition is expended, the chute is disconnected from the gun, the other chute is connected. The time to change chutes is minimal. The performance of the modified system has been proven on actual Nighthawk missions to be comparable to the standard system.

(3) Conclusion and Recommendation

(a) Conclusion

This modified mini-gun system does effectively increase the ammunition capacity of the Nighthawk system.

(b) Recommendation

A determination be made to verify whether the Nighthawk system does require a greater ammunition capacity. If so, recommend this modified system be considered as a candidate during testing.

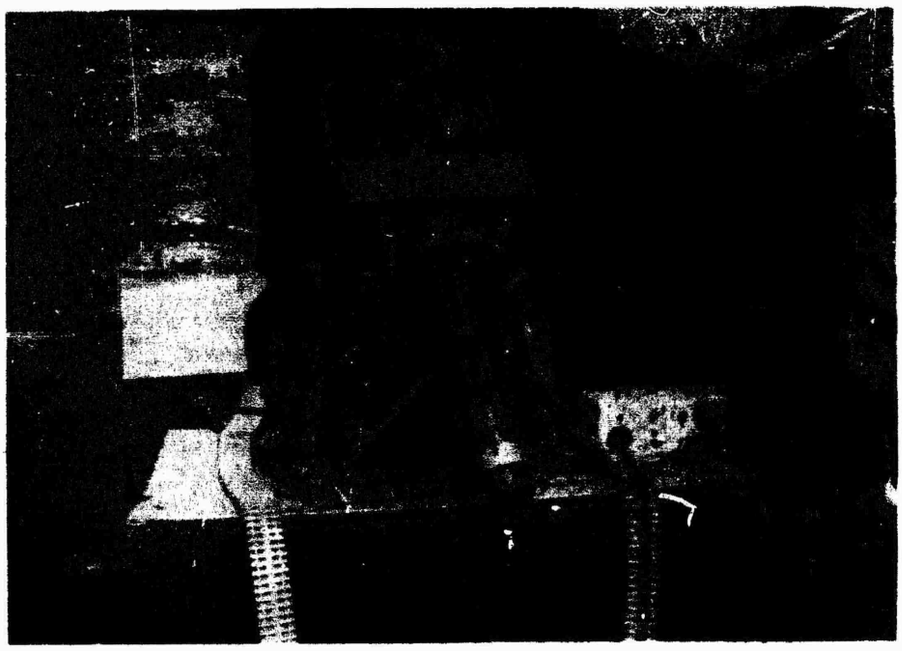


FIGURE II-30. Modified Minigun System (NIGHTHAWK) (UH-1).

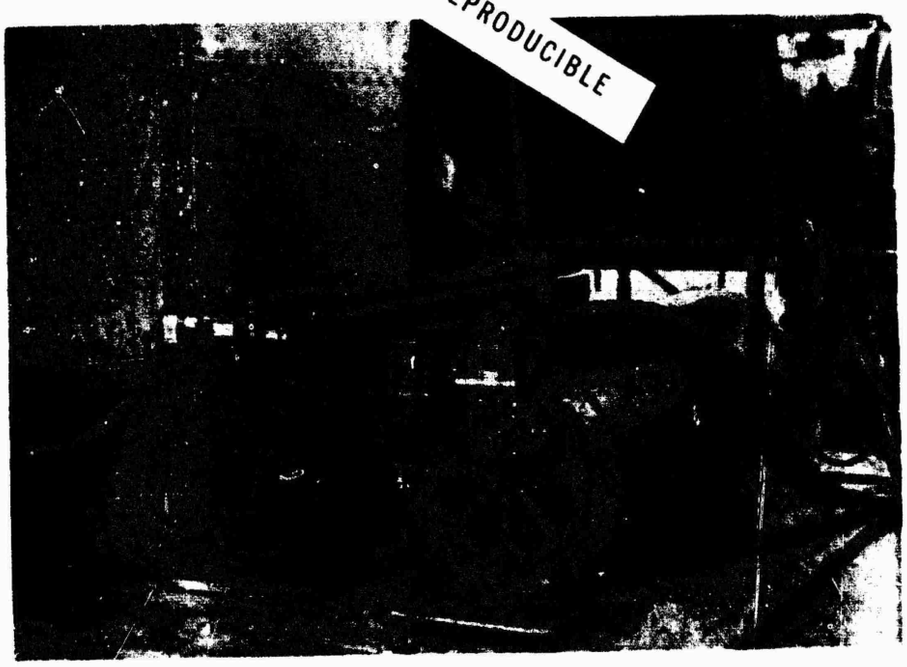


FIGURE II-31. Modified Minigun System (NIGHTHAWK) (UH-1).

t. Flare Container (UH-1)

(1) Purpose/Problem

To provide a container for flares used during night missions and to facilitate dispensing of these flares by an individual seated at station 117.0.

(2) Description/Discussion

The container is constructed from .030" sheet metal, and mounted on the front aft and rear front hardpoints (see figures II-32 and II-33). The container is 44. 5 inches in length, 25 inches wide at the top, tapered to 15.5 inches at the bottom. A standard seat belt is attached to the rear of the container and anchored to a cargo tie down ring to secure it in the up position. The seat belt quick release enables the flares to be dumped overboard in case of fire or other emergencies. The container has a capacity of thirteen flares, and allows orderly storage. The cost includes two sheets of .030" sheet metal and 12 manhours for fabrication. This container can be installed on any helicopter assigned flare missions.

(3) Conclusion and Recommendation

(a) Conclusion

The container improves safety by enabling flares to be jettisoned from the cargo compartment, and provides an orderly manner in which to store them in flight.

(b) Recommendation

Sufficient information be disseminated to all aviation units performing flare missions to enable fabrication of the expedient.

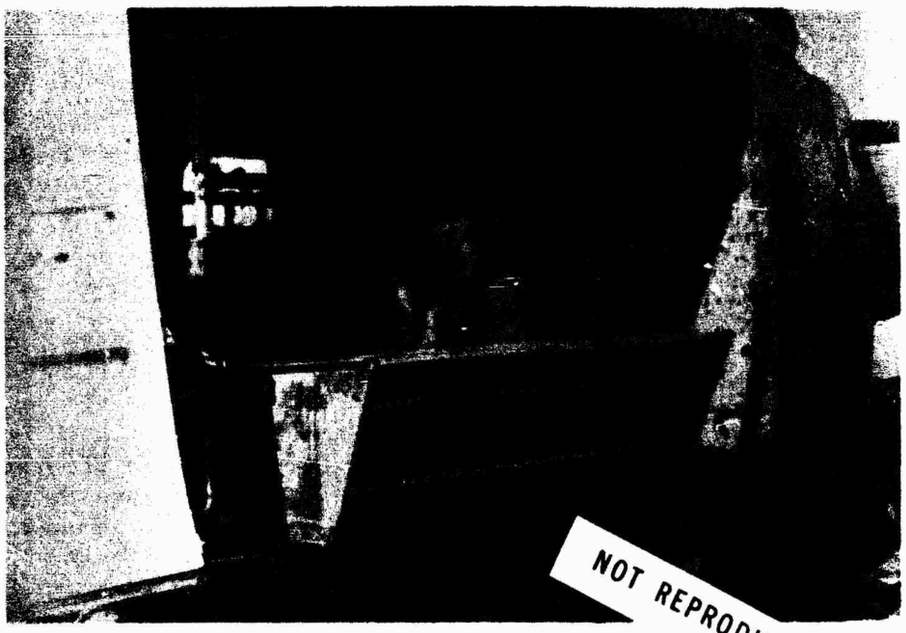


FIGURE II-32. Flare Container.

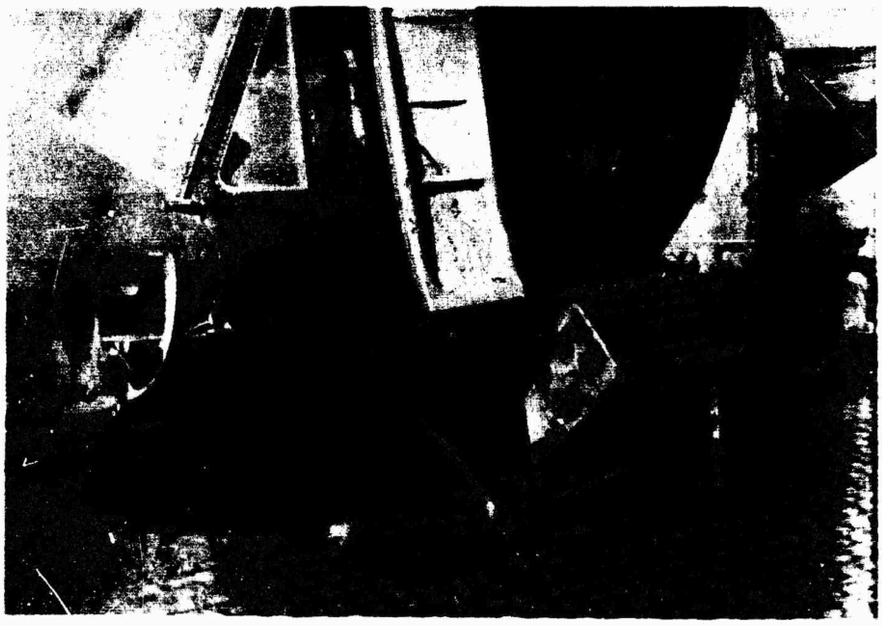


FIGURE II-33. Flare Container.

a. Pitch Change Link Length Jig (AH-1G)

(1) Purpose/Problem

To provide a ready reference for setting approximate length of pitch change links while the rod end remains attached to the blade grip (figure II-34).

(2) Description/Discussion

The tool is constructed using 1/8-inch metal. The length is 6 3/4 inches, width is 3/4-inch and the jig is curved in order to clear the adjustment bolts on the pitch change link. The tool is primarily used in performing a quick change of main rotor blades at field locations. Approximately 1 manhour is required to construct the pitch change link jig. This tool can only be used on the AH-1G aircraft.

(3) Conclusion and Recommendation

(a) Conclusion

The pitch change link jig saves time by providing maintenance personnel with a quick reference for setting pitch change link lengths without removing the link from the head assembly.

(b) Recommendation

Sufficient information be disseminated to all aviation units equipped with AH-1G aircraft to enable fabrication of the tool.

FIGURE II-34. Pitch Change Link Length Jig (AH-1G).

2. HELICOPTER, OBSERVATION

a. Tail Rotor Drive Shaft Bearing (OH-58A)

(1) Purpose/Problem

To change the direction in which the tail rotor drive shaft bearing torque adjustment bolt faces. The maintenance procedures in TM 55-1520-228-35 (pp. 7-18, reference I-1g), require that the tail rotor drive shaft hanger bearing be torqued while the aircraft is running requiring maintenance personnel to torque the number 5 hanger bearing within 5 inches of the turning tail rotor thus creating a safety hazard.

(2) Description/Discussion

Number 5 tail rotor drive shaft bearings have been rotated 180° to place the torque bolt on the opposite side of the tail boom from the tail rotor (see figure II-35). The bearings can be changed by the crew chief in 2 manhours. The additional spacing between tail rotor and torque bolts has greatly reduced the hazard of personnel injuries. This procedure is applicable to the OH-58A helicopter only.

(3) Conclusion and Recommendations

(a) Conclusion

The additional clearance provided by rotating the bearings 180° avoids the danger of injury to personnel with no decrease in performance or bearing life.

(b) Recommendations

1. The procedure in TM 55-1520-228-35, for torquing the hanger bearing, be changed as described above.

2. The cognizant agency publish a MWO requiring units to reposition the tail rotor drive bearing as described above, and the bolts on new OH-58As be repositioned by the manufacturer.

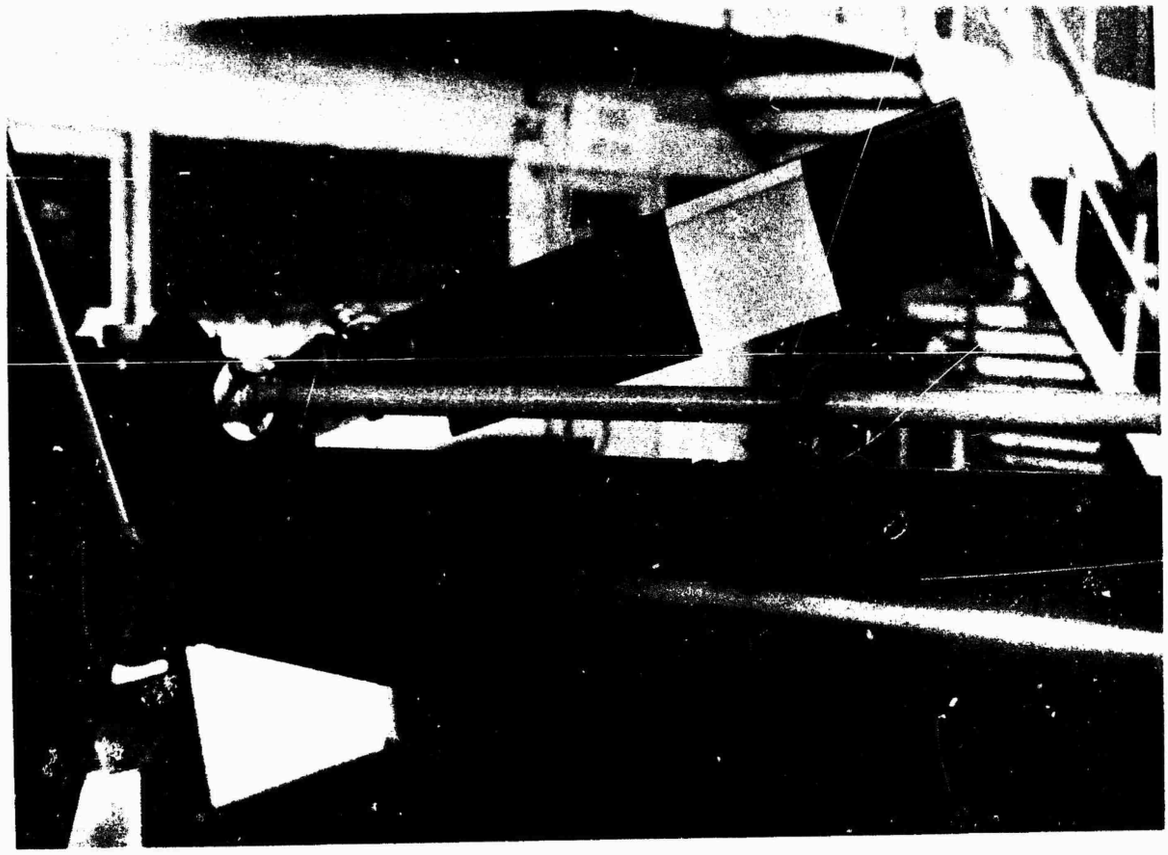


FIGURE II-35. Tail Rotor Drive Shaft Bearing (OH-58A).

3. HELICOPTER TRANSPORT (CARGO)

a. Chip Detector Plug Tool (CH-47)

(1) Purpose/Problem

To allow removal of the engine chip detector plug and engine oil drain plug while the engine is still installed (see figure II-36). With the engine installed, only limited work space to operate tools is available due to the close proximity of engine mounts and accessories (see figure II-37). A standard length tool cannot be positioned to remove the two plugs.

(2) Description/Discussion

A standard 13/16-inch box-end wrench was cut off to a length of 4 inches. Resources required are the standard 13/16-inch, box-end wrench and minimal manhours required to cut it to 4 inches in length.

(3) Conclusion and Recommendation

(a) Conclusion

The design of the wrench permits removal of the plugs without removing any of the engine accessories.

(b) Recommendation

A chip detector plug tool be developed and included in the aircraft mechanic's tool set.

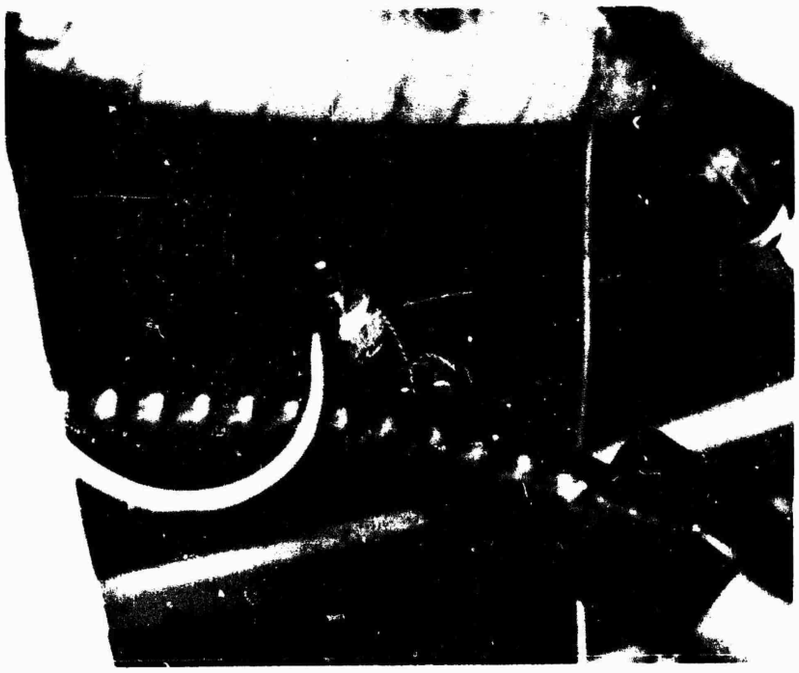


FIGURE II-36. Chip Detector Plug (CH-47).

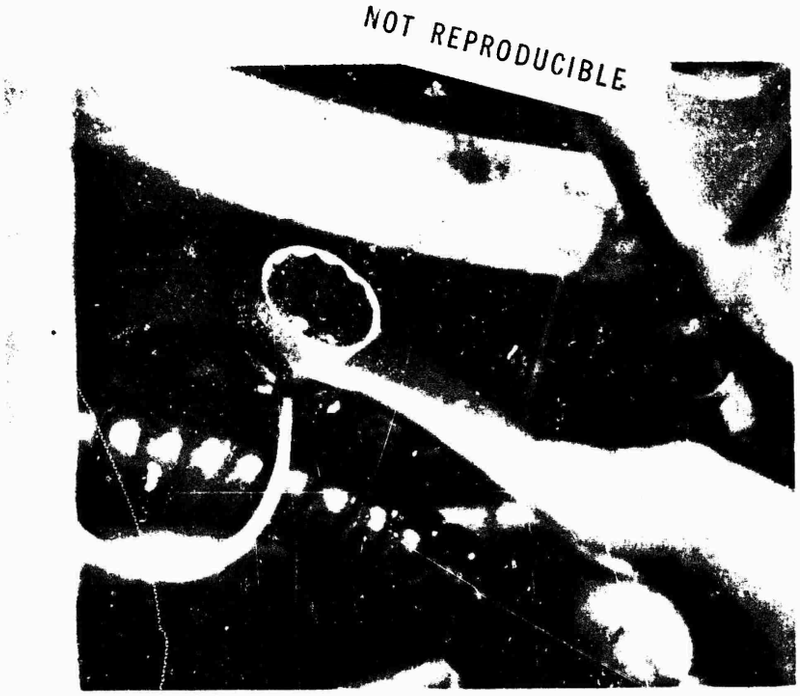


FIGURE II-37. Chip Detector Plug Tool (CH-47).

b. Drive Shaft Bolt Torque Tool (CH-47)

(1) Purpose/Problem

To facilitate torquing of the engine combination gear box drive shaft bolts (FSN 5310-106-0075 and FSN 5306-863-1120) in areas where space is not available to apply a torque wrench directly to the bolts (see figure II-38).

(2) Description/Discussion

A standard 9/16-inch, box-end wrench was cut off to an overall length of four inches. A 3/8-inch socket adapter was welded to the cut end to permit attachment to the torque wrench (see figure II-39). Cost includes the value of one 9/16-inch, box-end wrench, one 3/8-inch adapter, and approximately one manhour for construction. The drive shaft bolt wrench can be used on all models of the CH-47 aircraft.

(3) Conclusion and Recommendations

(a) Conclusion

The tool allows torquing of the drive shaft bolts with drive shaft installed.

(b) Recommendations

1. Such a tool be developed and be included in the aircraft mechanic's general tool set.

2. The value of the torque to be applied with the torque wrench extension be computed by the cognizant agency and provided to the field.

FIGURE II-38. Drive Shaft Bolt Torque Tool (CH-47).

FIGURE II-39. Drive Shaft Bolt Torque Tool (CH-47).

c. Engine Mount Tools (CH-47)

(1) Purpose/Problem

To remove the engine mount bolt which secures the T-55 engine to the CH-47 aircraft. Within the limited space provided by engine mount design it is difficult to remove the engine mount bolt.

(2) Description/Discussion

A 1/4-inch adapter socket was welded to the 3/8-inch end of an 5/16 x 3/8-inch box-end wrench. By using the wrench with the adapter welded in place, maintenance personnel can attach a torque wrench and loosen/tighten engine mount bolts to the proper torque (see figure II-40). Also the 5/16 x 3/8-inch box-end wrench was bent 30° in the center of the shank to displace the unused end of the wrench away from the engine mount. With the shank bent, the removal or installation of the engine mount is facilitated, since the unused end of the wrench is away from the engine, allowing more space to operate (see figure II-41). The wrench reduces the time required for removal and installation of engine mount bolts by approximately 50 percent. No cost is incurred, since the wrench can still perform the function for which it was originally designed. The two wrenches can be used on all models of the T-55 engine installed in the CH-47A, B and C aircraft.

(3) Conclusion and Recommendations

(a) Conclusion

The tool allows torquing of the engine mount bolts in the limited space available.

(b) Recommendations

1. The torque wrench extension computation necessitated by the additional length be made by the cognizant agency and provided to the field.

2. Sufficient information be disseminated to all aviation units equipped with CH-47 aircraft, to enable fabrication.

FIGURE II-40. Engine Mount Tool (CH-47).

FIGURE II-41. Engine Mount Tool (CH-47).

d. Generator Removal Tool (CH-47)

(1) Purpose/Problem

To facilitate removal of generator bolts and installation of CH-47 electrical generators. Available space is insufficient for the use of a rachet, so the bolts have to be removed with an open end wrench. Construction of the generator is such that the attaching bolts cannot be installed or removed with any standard size socket wrench (see figure II-42).

(2) Description/Discussion

A standard socket is tapered to 1/2-inch diameter on the drive end to allow for clearance on the generator housing (see figure II-43). The tapered socket allows the use of a rachet when installing or removing the generator. Using the expedient and a rachet, the time required for generator installation and removal is reduced by 50 percent. This expedient can be used on all models of the CH-47 aircraft. Cost is minimal, and includes one 5/8-inch, shallow-well socket, use of a grind stone, and approximately one manhour to reduce the diameter from 3/4-inch to 1/2-inch.

(3) Conclusion and Recommendation

(a) Conclusion

The tool reduces the time required for installation and removal of the generator by 50 percent.

(b) Recommendation

Such a tool be included in the aircraft mechanic's general tool set.

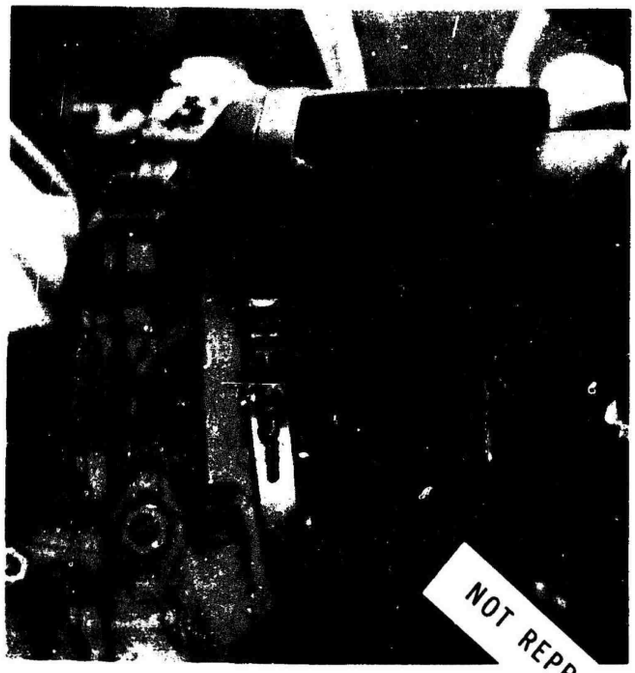


FIGURE II-42. Generator on CH-47.

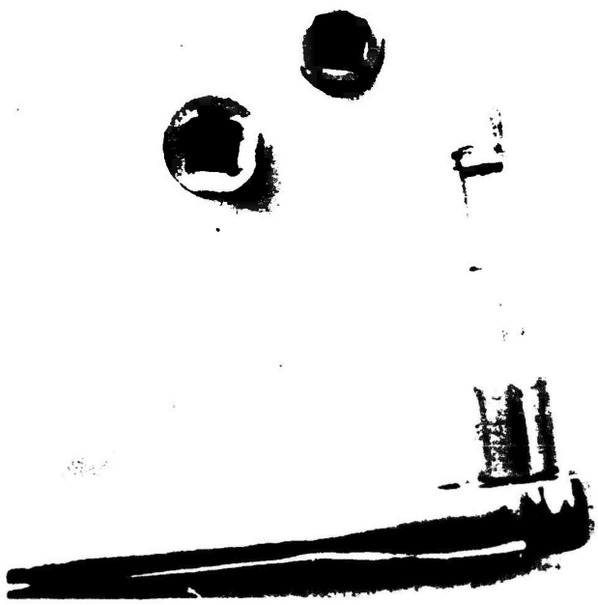


FIGURE II-43. Generator Removal Tool.

e. Ignitor Plug Wrench (CH-47)

(1) Purpose/Problem

To allow removal of the ignitor plug from all models of the CH-47 helicopter engine while the engine remains installed in the airframe (see figure II-44). With the engine installed, fuel and electrical lines restrict access to the ignitor plugs.

(2) Description/Discussion

The jaws of a standard 15/16 x 7/8-inch, open-end wrench were filed down to reduce the thickness from 5/16-inch to 1/8-inch. This allows the wrench to be inserted between the diffuser section of the engine and the engine harness. The thinner wrench allows installation and removal of the ignitor plug without removing the fuel and electrical harness which is mounted in close proximity to the ignitor plug receptical (see figure II-45). The tool decreases aircraft down time by allowing the crew to change ignitor plugs at a field location without dismantling the engine harness. Cost includes one open-end 15/16 x 7/8-inch wrench, and one man-hour to reduce the jaw thickness from 5/16 to 1/8 inch. The wrench can be used on all models of the T-55 engine used on CH-47 aircraft.

(3) Conclusion and Recommendation

(a) Conclusion

The ignitor plug wrench permits the removal and installation of ignition plugs from CH-47 engines while the engines remain installed in the airframe.

(b) Recommendation

Such a tool be included in the aircraft mechanic's general tool set.

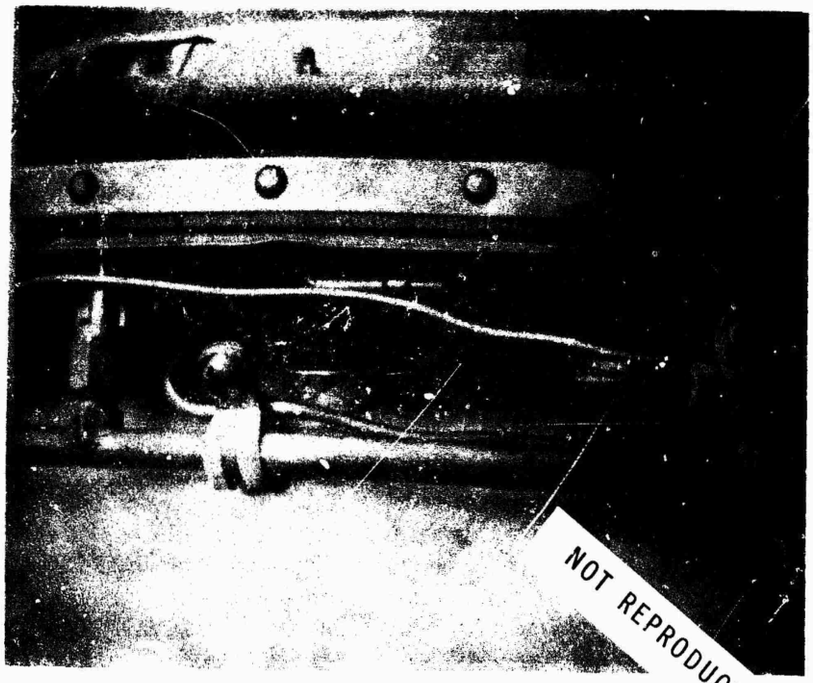


FIGURE II-44. Ignitor Plug (CH-47).

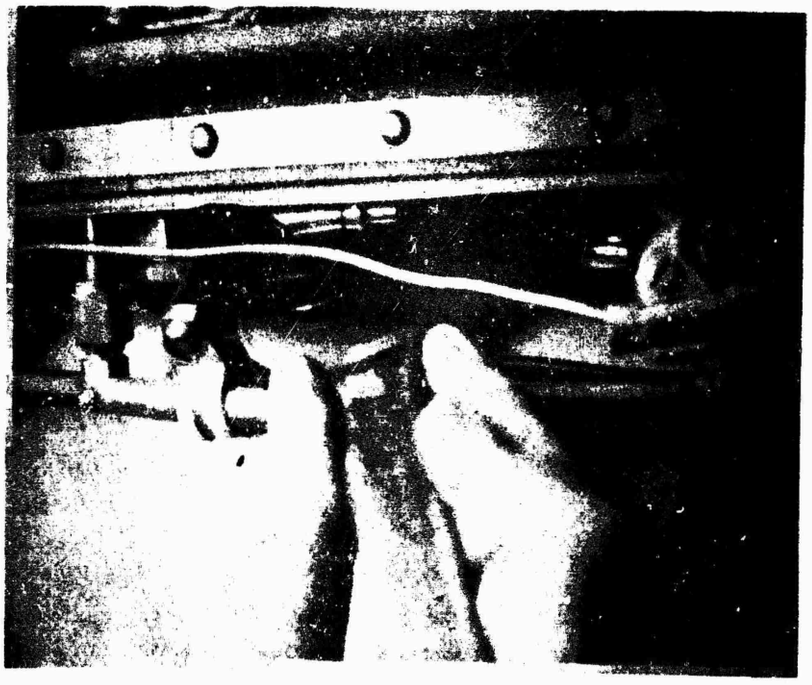


FIGURE II-45. Ignitor Plug Wrench (CH-47).

f. Jig for Transmission Key (CH-47)

(1) Purpose/Problem

To maintain the transmission key in stable position for precision drilling (see figure II-46). The transmission key (often refered to as the "bathtub key") FSN 5315-089-3000, does not have a hole in it when procured.

(2) Description/Discussion

The jig is made of 2-inch round brass stock. The total length is 2 1/2 inches. The top is machined to fit a bathtub key flush with the surface of the jig. Two 1/8-inch, standard thread Allen head screws, inserted into the clamp, secure the key for drilling (see figure II-47). Cost incurred includes the brass stock and approximately 3 manhours to fabricate the jig. This expedient applies only to the CH-47 aircraft.

(3) Conclusions and Recommendation

(a) Conclusions

1. The jig reduces the possibility of drilling the hole off center

2. By using the jig, units do not have to use the trial and error method of drilling.

(b) Recommendation

The cognizant agency develop such a jig and issue to all aviation units having CH-47 aircraft.

FIGURE II-46. Jig For Transmission Key (CH-47).

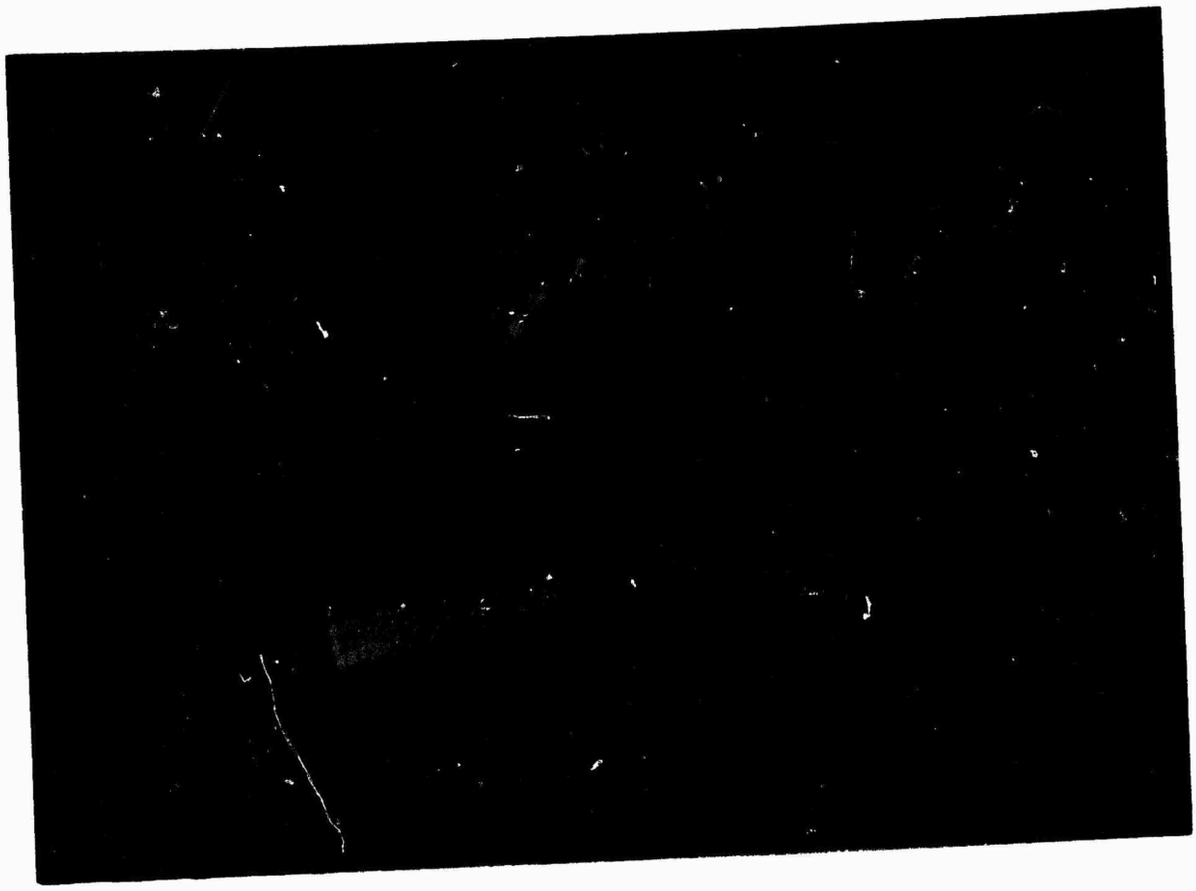


FIGURE II-47. Jig For Transmission Key (CH-47).

4. AIRPLANE, OBSERVATION

a. Aircraft Exhaust Sealant (O-1G)

(1) Purpose/Problem

To increase sealing efficiency of exhaust pipe retaining clamps (FSN 5340-047-2415), and prevent exhaust gases from leaking at the couplings and entering the cockpit.

(2) Description/Discussion

Aluminum foil has been wrapped underneath exhaust clamps to seal the connection and increase the efficiency of the clamp (see figure II-48). Due to heating and cooling of the exhaust system, the retaining clamp of the O-1G becomes distorted; by applying aluminum foil, a positive seal is provided. Technical manuals require exhaust systems be completely sealed to prevent the possibility of carbon monoxide fumes entering the cockpit, but clamps, reinstalled at completion of periodic equipment inspection, have resulted in exhaust leakage. Utilizing aluminum foil as a seal, clamps have been reinstalled numerous times with no leakage. Aluminum foil can be procured locally at the self-service supply center. Aluminum foil could be used on all reciprocating engines having exhaust systems with similar clamps.

(3) Conclusion and Recommendations

(a) Conclusion

Aluminum foil increases the sealing capability of the exhaust clamps, and prevents a potential safety hazard.

(b) Recommendations

1. The exhaust clamps be redesigned to seal the exhaust system effectively.

2. Information be disseminated to using units concerning the expedient use of aluminum foil in this application.

FIGURE II-48. Aircraft Exhaust Sealant (O-1G).

b. Cockpit Storage Containers (O-1G)

(1) Purpose/Problem

To provide accessible storage for smoke grenades and other equipment in the O-1G aircraft, thus removing the hazard of loose articles in the cockpit.

(2) Description/Discussion

(a) The container for smoke grenades is eleven inches in length, three inches in width, and six inches in height. A piano hinge is mounted at the front and rear top, with a fastener to secure the top (see figure II-49).

(b) A fuel sample bottle container was mounted to the cockpit door between the standard map case and the smoke grenade container. The total length is approximately 6 inches and is secured to the door by a screw. The container for the bottle is approximately 2 1/2 inches in width and 3 inches in depth. Other items (e.g. pitot cover) may be stored in the container when the fuel sample bottle is not required (see figure II-50).

(c) A pencil container was mounted on the cockpit wall forward of the cabin door. The container enables storage of three pencils. Slots are large enough to accomodate the large type "grease" pencil (see figure II-51).

(d) The containers decrease the hazards created by loose articles in the cockpit which could lodge in the controls or distract the pilot. The containers can also be used for map storage, aircraft logs, or as a lunch box on extended flights. Construction and maintenance cost is minimal because scrap sheet metal is used in fabrication. The expedients can be constructed and attached to aircraft by the crew chief in approximately 3 manhours. The expedients are applicable primarily to the O-1G aircraft.

(3) Conclusion and Recommendation

(a) Conclusion

The storage containers contribute to safety as well as convenience.

(b) Recommendation

Sufficient information be disseminated to all aviation units equipped with O-1 aircraft for fabrication.

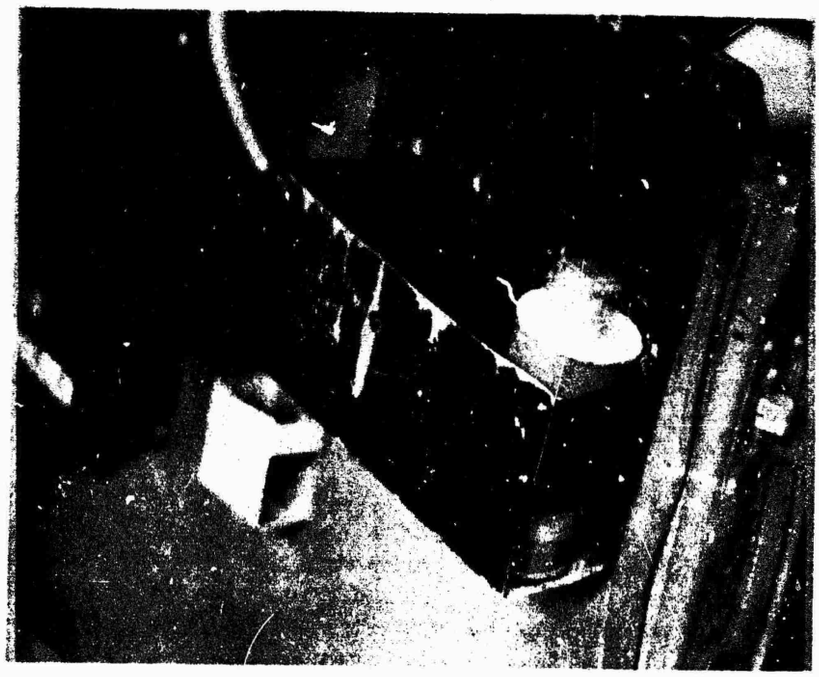


FIGURE II-49. Smoke Grenade Container (0-1G).

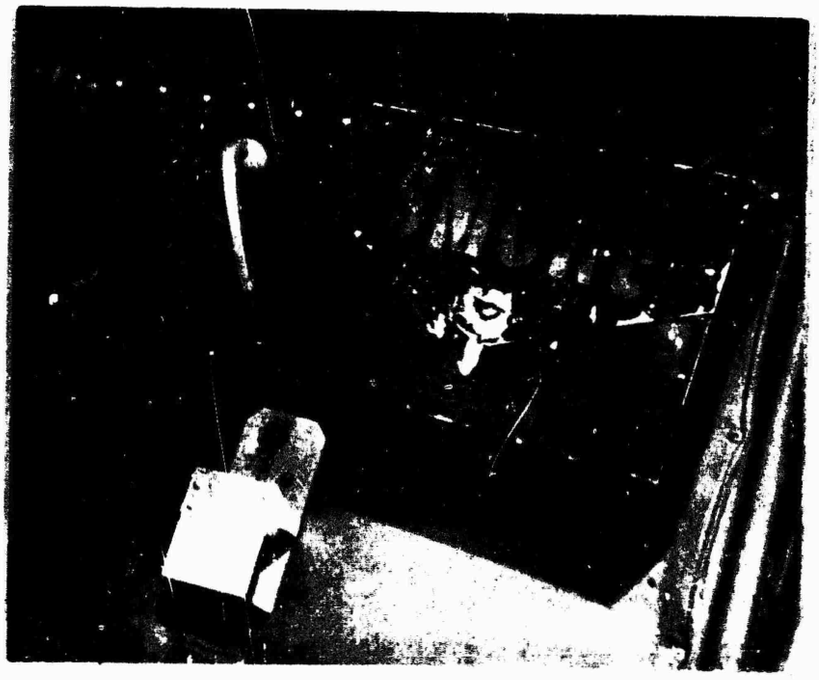


FIGURE II-50. Fuel Sample Bottle Container (0-1G).

FIGURE II-51. Pencil Container (0-1G).

c. XM-76 Trigger Safety Pin (O-1G)

(1) Purpose/Problem

To prevent the firing switch of the XM-76 weapons system from being depressed accidentally. Positioning of the firing trigger is non-standard between the different types of aircraft, e.g., the O-1G armament firing switch is in the same location as the radio transmitter switch on the UH-1. Consequently the possibility of unintentional firing is increased for dual-rated aviators.

(2) Description/Discussion

The device is constructed of a cotter pin with a small chain attached and secured to the control stick. A 1/8-inch hole is drilled in the trigger to allow installation of the safety pin (see figure II-52). The safety pin prevents pilots from accidentally depressing the firing trigger and unitentionally firing ordnance. The safety must be removed before the system can be fired, even though all other switches are in the armed position. Cost includes one cotter pin with approximately three inches of chain to secure the pin to the control stick, and approximately one manhour to install the expedient. Maintenance cost consists of replacing the cotter pin approximately every 100 hours.

(3) Conclusions and Recommendation

(a) Conclusions

1. The trigger safety pin prevents the pilot from pressing the trigger to the firing position.

2. The safety pin can be installed in any aircraft with similar switches.

(b) The safety pin be adopted as a standard item.

PRECEDING PAGE BLANK

FIGURE II-52. XM-76 Trigger Safety Pin (0-1G).

d. Main Air Intake Filter Cover (O-1G)

(1) Purpose/Problem

To protect the air inlet filter from dirt, dust and debris during periods when the aircraft is parked, especially during the dry season. Aircraft not equipped with the dust cover must have the filter removed, cleaned, and reinstalled prior to each flight when operating in a dusty environment.

(2) Description/Discussion

Sheet metal is cut to a size of 7 11/16-inches by 8 1/16-inches to form the cover. A strip of sheet metal 7 inches long and 1/2-inch in width is shaped for a handle (see figure II-53). Two rivets are required for mounting the handle to the cover. The cover must be removed prior to flight. If left in place, the engine does not receive maximum air to the carburetor, and engine temperature will rise above allowable limits. The filter cleaning process requires a minimum of fifteen minutes. Utilizing the cover, the cleaning requirement is reduced to one time per day, which can be accomplished during the normal daily inspection of the aircraft. Cost incurred includes the sheet metal and approximately one manhour to construct the expedient. The current design of the expedient will fit all O-1 type aircraft. A streamer, approximately two feet in length, should be attached on the external side of the cover to insure removal prior to flight.

(3) Conclusion and Recommendation

(a) Conclusion

The main air intake filter cover, placed in position each time the aircraft is shut down, effectively blocks the intake thus preventing dust and debris from entering the filter compartment.

(b) Recommendation

Sufficient information be disseminated to all aviation units equipped with O-1G to enable fabrication of the expedient.

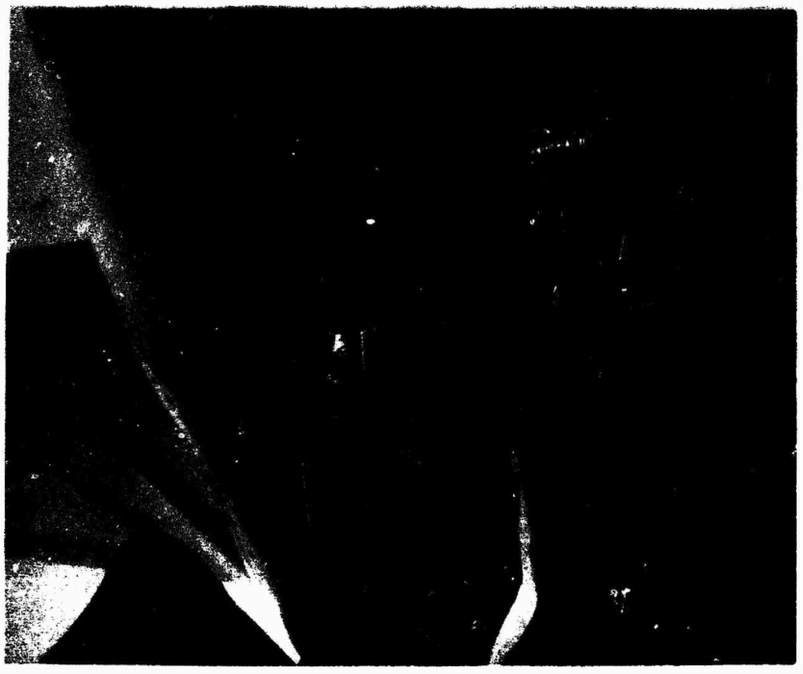


FIGURE II-53. Main Air Intake Filter Cover (O-1G).

e. Identification of Rocket Arm Circuit Breaker (O-1G)

(1) Purpose/Problem

To enable positive identification of the circuit breaker for the rocket arming system. It is necessary to disarm the aircraft rocket arming system at certain times for safety purposes. This expedient distinguishes the correct circuit breaker from others adjacent to it, without requiring the pilot to divert his attention from other duties in the cockpit to look at it.

(2) Description/Discussion

The rocket arm circuit breaker has been isolated from the other circuit breakers by wrapping the protruding end of the breaker with aircraft safety wire and attaching a grenade ring to the wire (see figure II-54). Safety hazards connected with diversion of the pilot's attention while disarming the XM76 weapons system have been reduced by positively identifying the circuit breaker. The crew chief can attach the expedient in approximately 10 minutes. Aircraft safety wire is readily available, and the pull ring is scrap material. The expedient could be used on any aircraft with similar type circuit breakers.

(3) Conclusions and Recommendation

(a) Conclusions

1. Installation of this expedient has facilitated disarming of the XM76 weapons system by allowing easier identification of rocket arm circuit breaker.

2. Periodic checks by the crew chief are necessary to determine that wire and pull ring are intact.

(b) Recommendation

The field expedient be adopted as a standard item.

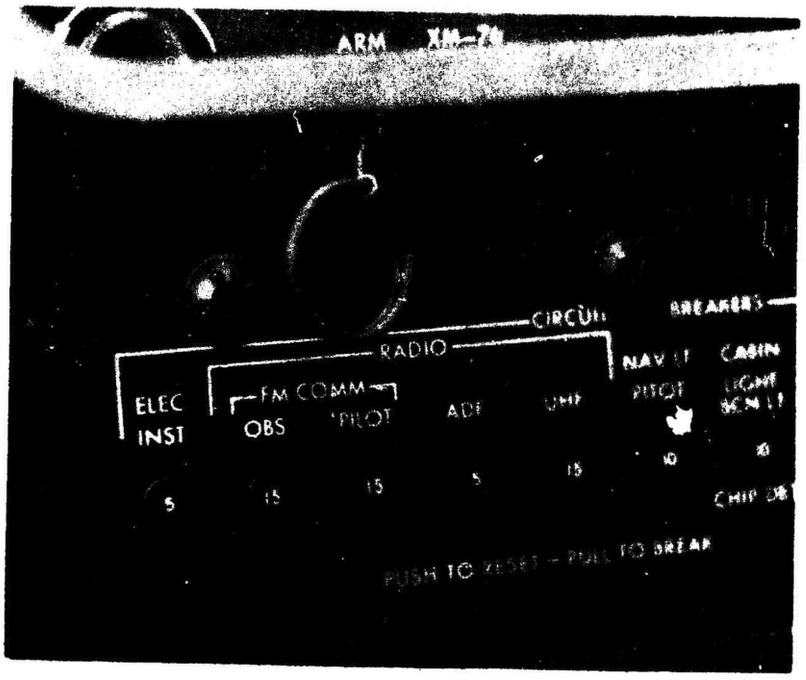


FIGURE II-54. Rocket Arm Circuit Breaker (O-1G).

5. AIRPLANE, UTILITY (U-1A)

a. Rear Window Wind Deflector (U-1A)

(1) Purpose/Problem

To decrease the amount of air entering the cabin of the aircraft during flight when the window is removed, and to prevent dust and dirt particles from blowing through the cabin and cockpit area.

(2) Description/Discussion

A piece of sheet metal 15 inches long and 3 inches wide is attached forward of the window on the aft cargo door by 7 rivets. The sheet metal is bent at a 30° angle away from the outside of the door (figures II-55, II-56). Construction can be accomplished at unit level. After initial installation only a visual inspection during the daily aircraft inspection is necessary. After installation, this expedient does not hinder suppressive fire by the crew chief during low-level operations. Cost incurred includes the sheet metal and approximately 2 manhours to fabricate and install. The air deflector can be installed to deflect air flow from openings on all types of aircraft.

(3) Conclusion and Recommendation

(a) Conclusion

The air deflector is effective in diverting air flow away from openings in U-1A aircraft cabins.

(b) Recommendation

Sufficient information be disseminated to all aviation units to enable fabrication of the expedient.

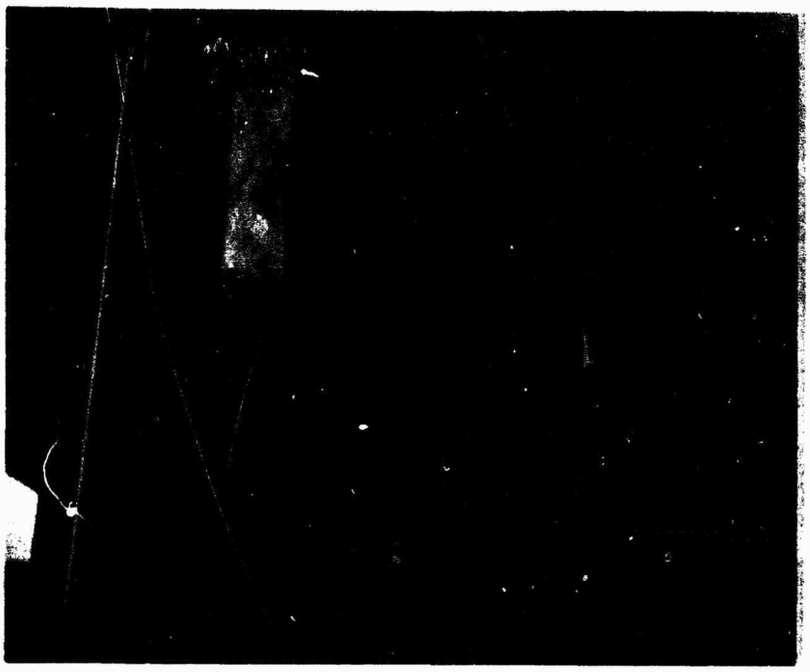


FIGURE II-55. Rear Window Wind Deflector (U-1A).

FIGURE II 56. Rear Window Wind Deflector (U-1A).

b. **Fresh Air Vent (U-1A)**

(1) Purpose/Problem

The fresh air deflector provides fresh air in the cockpit during ground operations when no standard air vent system is included on the aircraft.

(2) Description/Discussion

The air deflector is constructed of sheet metal and mounted on the pilot and copilot cockpit doors and provides a fresh air flow which can be regulated by the pilot or copilot (see figures II-57 and II-58). The tropical climate of RVN made this item particularly desirable. Cost incurred includes the sheet metal and approximately 2 manhours to fabricate and install on the aircraft. The air deflector could be adopted for use on other aircraft not having an adequate fresh air venting system.

(3) Conclusion and Recommendation

(a) Conclusion

The fresh air deflector provides fresh air in the U-1A cockpit when no standard air vent system was included on the aircraft.

(b) Recommendation

Sufficient information be disseminated to all aviation units to enable fabrication of the expedient.

FIGURE II-57. Fresh Air Vent (Exterior View) (U-1A).

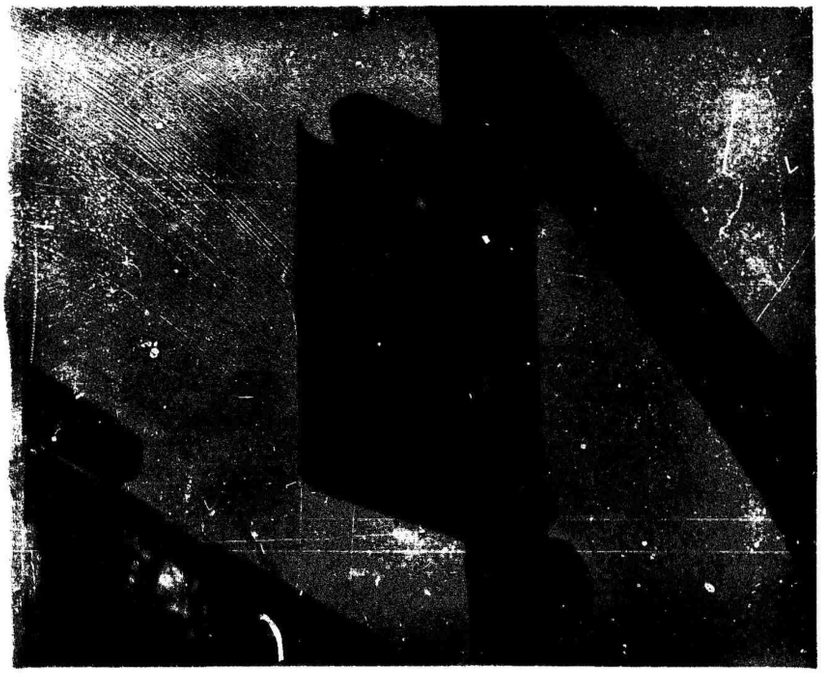


FIGURE II-58. Fresh Air Vent (Interior View) (U-1A).

6. SPECIAL PURPOSE EQUIPMENT

a. Flight Line Intervalometer Test Set

(1) Purpose/Problem

The set performs the function of the intervalometer tester PT-1118, allowing checkout and test of the installed intervalometer unit 05-1115 and interconnecting AH-1G aircraft wiring. The PT-1118 is large and bulky and not easily used on the flight line (see figure II-59).

(2) Description/Discussion

The test set is packaged in a small plastic box with approximate dimensions of 1 1/4" x 1 1/4" x 6", as shown in figure II-60. The external connector allows the test set to be connected to provide a terminal for the intervalometer sequencer and interconnecting aircraft wiring. The electrical cable between aircraft and rocket pod is disconnected and the test set is connected to the aircraft cable (see figure II-61). The rocket firing circuits are energized, and the firing sequence selected on the control panel in the aircraft is displayed on the miniature light bulbs of the test set. Power to fire the rockets is measured on the wattmeter of the test set. All power required by the test set is provided by the aircraft. The following components are used for construction: 1 ea. SCR 2N1596 CE; 4 ea. diode JAN IN483B Ratheon Co, FSN 5961-892-0734; 19 ea. lamp, FSN 6240-155-7836; 19 ea. diode IN34A; 1 ea. meter 0-200MA; 1 ea. plug w/wire leads, FSN 1055-400-2473; 1 ea. capacitor .luf 200V D.C.; 1 ea. 3K ohm resistor; 2 ea. 10K ohm resistor; 1 ea. 10K ohm variable resistor adjusted for full scale deflection of meter at 28V D.C. See figure II-61a for a schematic diagram of the circuit.

(3) Conclusions and Recommendation

(a) Conclusions

1. The test set expedites checkout of the intervalometer and interconnecting aircraft cabling, utilizing aircraft electrical power.

2. The test set can be used on all armed aircraft equipped with the intervalometer unit 05-1115 and the standard rocket pod connector.

(b) Recommendation

Further development of this field expedient be conducted by the cognizant agency with a view toward eventual issue as a standard item.

FIGURE II-59. Intervalometer Tester PT-1118.

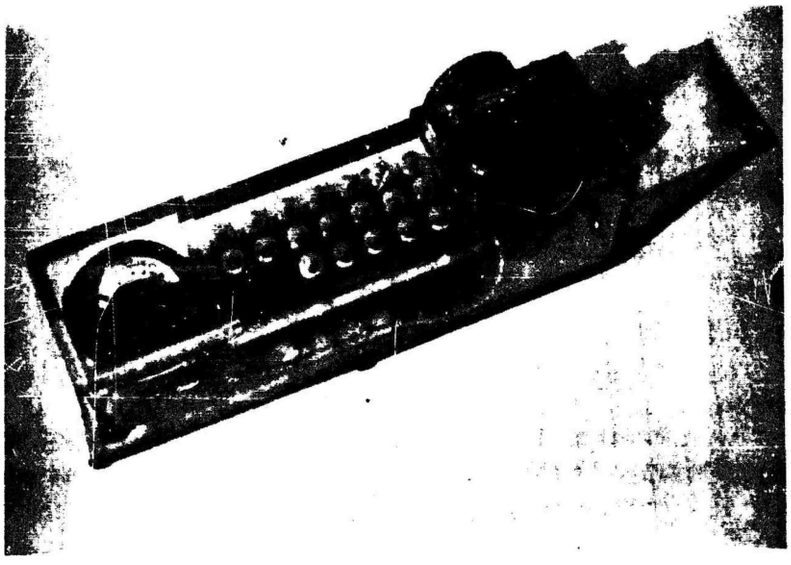


FIGURE II-60. Flight Line Intervalometer Test Set.

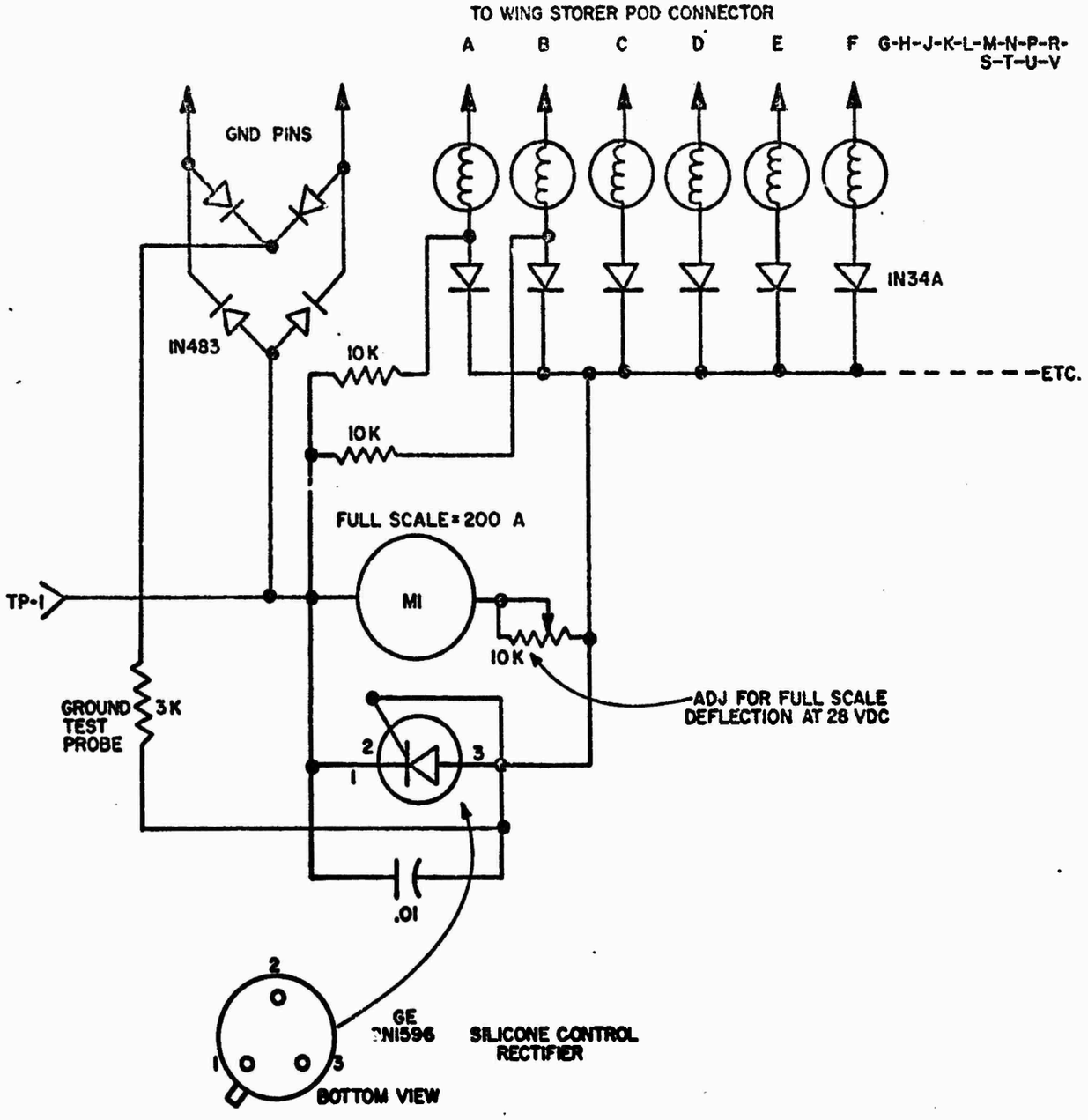


FIGURE 61A. Schematic Diagram-Flight Line Intervalometer Test Set.

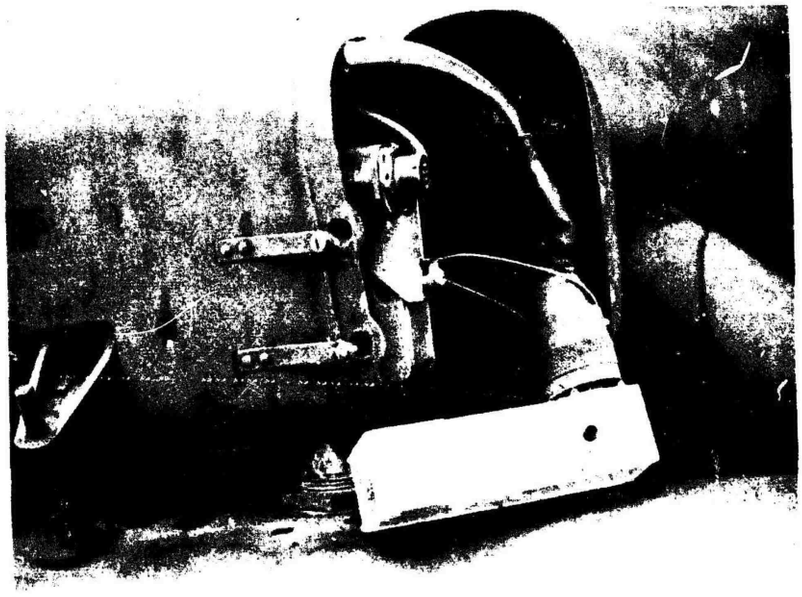


FIGURE II-61. Flight Line Intervalometer Test Set.

b. Electric Wrench

(1) Purpose/Problem

To remove and replace aircraft inspection panels during inspection and maintenance more rapidly than is possible using standard general mechanic's tools.

(2) Description/Discussion

A standard ammunition boost motor for the XM6 armament system is used as the drive motor. A grip is constructed of fiberglass (see figure II-62). A function switch is located at the base of the grip to control direction of drive. The wrench is equipped with thirty-five feet of electrical cord with a standard cannon plug on the end (see figure II-63). The plug is connected to the test equipment receptacle in the nose of the AH-1G for power. The wrench is attached directly to the aircraft battery when used on aircraft other than the AH-1G. The wrench has a 1/4-inch adapter installed on the drive shaft to allow use with all sockets in the general mechanic's tool set. Cost would include the drive motor, case, and thirty-five feet of electrical cabling. Approximately 4 manhours are required to construct the electric wrench.

(3) Conclusions and Recommendation

(a) Conclusions

1. The electric wrench has reduced the time required to remove and replace aircraft inspection panels.

2. The wrench can be used for any other light duty purpose, provided a 24-volt power supply is available.

(b) Recommendation

Further development of the field expedient be conducted by the cognizant agency with a view toward eventual issue as a standard item.

FIGURE II-62. Electric Wrench.

FIGURE II-63. Cannon Plug For Electrical Wrench.

c. Modification to Sweeney Engine Stand (T-53)

(1) Purpose/Problem

To provide a rough terrain capability for the existing Sweeney stand. The Sweeney adapter, FSN 4920-084-3305, and trailer assembly, FSN 4920-897-5623, are not being used by many units because of its lack of rough terrain mobility (see figure II-64). It is difficult to move the stand over unpaved and rough terrain because of its small wheels.

(2) Description/Discussion

There were no observed instances in which the Sweeney stand had been modified; however, there have been several other moveable engine stands fabricated (see figure II-65). None of these stands have proven as dependable or versatile as the Sweeney stand, but a stand with rough terrain capabilities is needed by aviation units. The cost would consist of replacing the existing 8 small wheels by 4 large ones, or construct a complete new stand similar to the Sweeney stand, but having wheels of about 10-inch diameter. With the installation of larger wheels on the Sweeney stand it would be more mobile.

(3) Conclusion and Recommendations

(a) Conclusion

The addition of large wheels to the Sweeney engine stand would greatly improve its mobility.

(b) Recommendations

1. All existing Sweeney engine stands be modified by the addition of larger wheels.

2. A new stand, similar to the Sweeney stand, with rough terrain capability be developed.

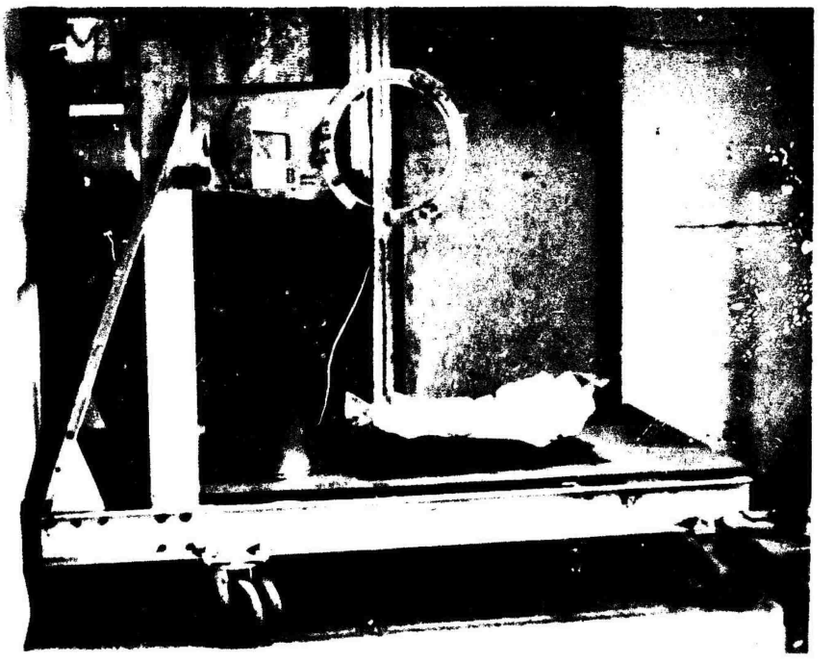


FIGURE II-64. Sweeney Stand.

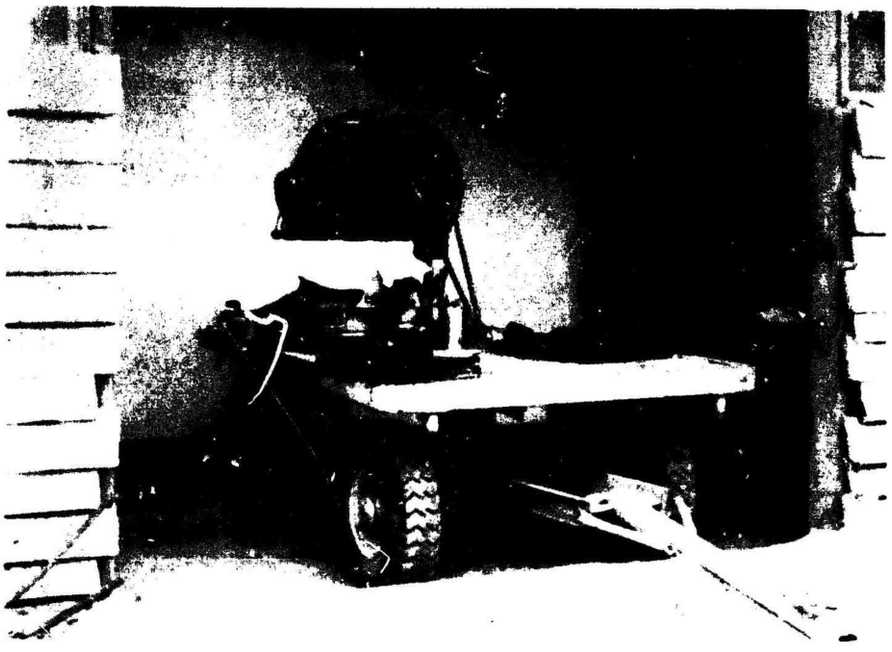


FIGURE II-65. Modified Engine Stand.

d. Rocket Transporter

(1) Purpose/Problem

To facilitate rearming of helicopters at some distance from the ammunitions storage area.

(2) Description/Discussion

The rocket transporter is constructed using the front and rear dolly from trailer model 4003 as issued with the Shop Set, Aircraft Maintenance, (Airmoble), Company Size, Direct Support, FSN 4920-133-8154. Part numbers for assemblies are: front 7400052, rear 7400055, (see figure II-66). Four-inch angle iron is used to connect and extend the dollies to an overall wheel base of ten feet. Three-inch bolts are used for attachment. Wood 2x4's are used to construct 18 shelves for storage of 226 2.75" FFAR (see figure II-67). The transporter can be towed by 1/4-ton, 3/4-ton, or 2 1/2-ton vehicles to the rearming point thus permitting storage areas to be located away from aircraft parking areas. The transporter allows the armament section to unpack, assemble the rocket motor and warhead, and store for immediate use. Using this method aircraft which are being armed do not endanger the ammunition storage area. Cost for construction includes 16 feet of 4-inch angle iron, 354 feet of 2" x 4" wood and two sheets of corrugated metal.

(3) Conclusions and Recommendation

(a) Conclusions

1. The transporter increases safety during rearming.

2. The unit can carry sufficient rockets to rearm several AH-1G aircraft which have 19-round rocket pods.

3. Time required for rearming aircraft is significantly reduced, since the trailer can be positioned in close proximity to the aircraft.

(b) Recommendation

Further development of this field expedient be conducted by the cognizant agency with a view toward eventual issue as a standard item.

FIGURE II-66. Rocket Transporter.

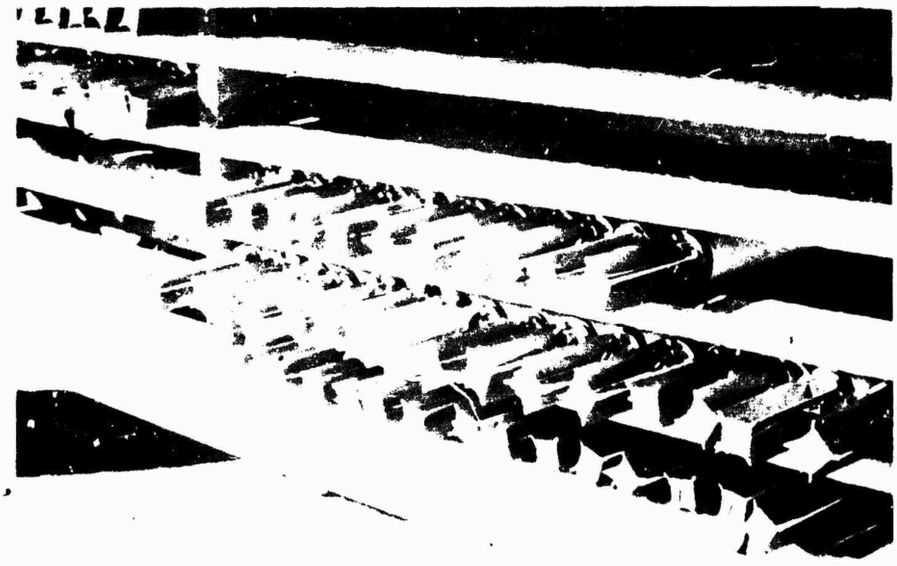


FIGURE II-67. Rocket Transporter.

e. Handgrip For M60 Machine Gun

(1) Purpose/Problem

To provide increased control and maneuverability for handheld doorguns. UH-1C doorguns are fired using two methods. One is a nylon bungee cord hooked to the roof to support the weapon. The second is the handheld or free gun.

(2) Description/Discussion

This expedient affords greater control of the weapon in the handheld method (see figures II-68, 69, 70 and 71). The handgrip is constructed using alluminum stock for the grip and 1/4-inch steel plate for the mount. Approximately 1 manhour is needed to fabricate the entire assembly. Finger grips may be machined on the handgrip if desired. The mount is secured to the weapon with three bolts which extend through the plastic stock of the weapon. The handgrip has been used extensively on missions with no damage incurred from mis-aimed rounds or ejected brass. When firing from the aircraft's left side the weapon is held upside down so that brass is ejected under the aircraft and away from the tail rotor. The weapon is fired normally from the right side. No cost is incurred in fabrication as scrap materials are used. 500 to 1000 rounds of inflight firing are necessary for familiarization. This expedient prevents hand burns when the weapon becomes very hot during extensive firing. If the handgrip fails, it could result in an uncontrolled gun. This handgrip can be used on any handheld machine gun.

(3) Conclusion and Recommendation

(a) Conclusion

This handgrip increases control and maneuverability for handheld doorguns; however its failure could cause a safety hazard.

(b) Recommendation

This handgrip be further developed for possible adoption as a modification to M60 machine guns used as handheld doorguns.

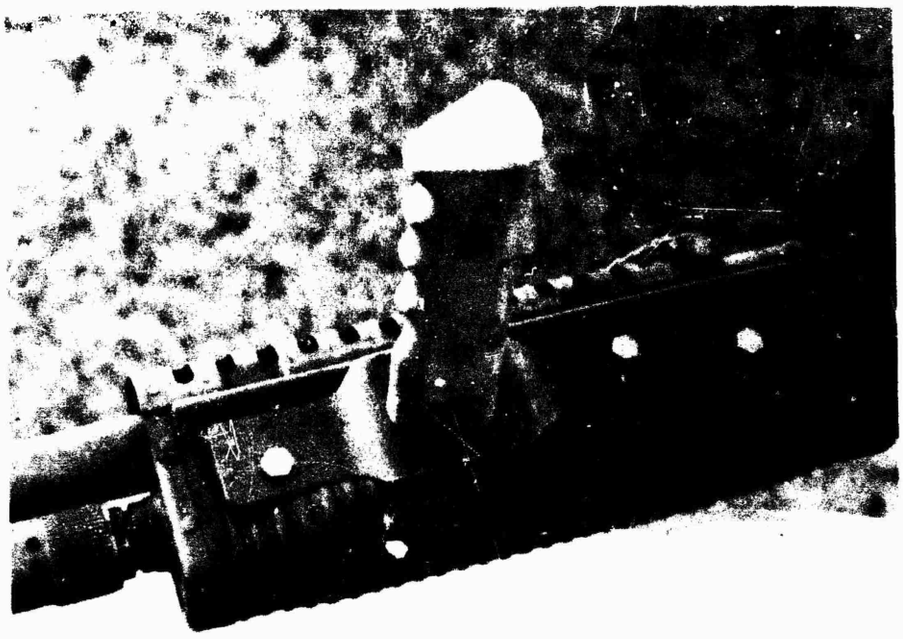


FIGURE II-68. Handgrip For M60 Machinegun.

FIGURE II-69. Handgrip For M60 Machinegun.

FIGURE II-70. Handgrip For M60 Machinegun.

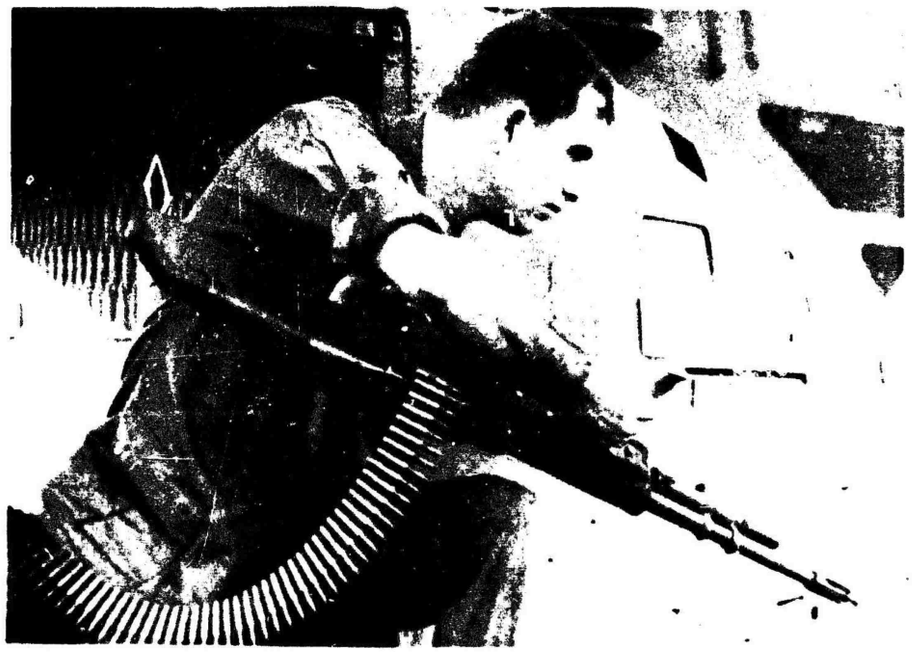


FIGURE II-71. Handgrip For M60 Machinegun.

f. Floating Smoke Grenade

(1) Purpose/Problem

To provide the M-18 smoke grenades, used to mark positions in rice paddies, with a flotation capability. Normally M-18 smoke grenades sink in water and are rendered less efficient.

(2) Description/Discussion

The bottom half of the M-18 smoke grenade shipping container is taped to the grenade (see figure II-72). With the container taped to the smoke grenade, a flotation capability is provided, and the grenade can emit smoke while floating on the top of water or rice paddies.

(3) Conclusion and Recommendation

(a) Conclusion

The expedient allows the grenade to float in water, thus increasing it's effectiveness.

(b) Recommendation

This information be disseminated to all Army aviation units.

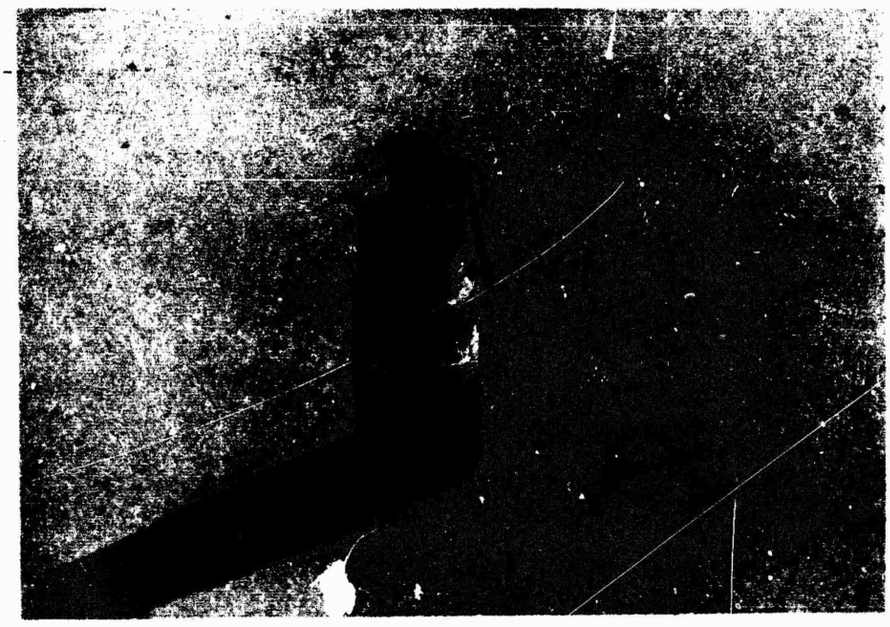


FIGURE II-72. Floating Smoke Grenade.

7. AVIONICS

a. Substitute Radio

(1) Purpose/Problem

To improve ground-to-air communication capability.

(2) Description/Discussion

The radio set AN/ARC-51 BX provides ground-to-air communication in the VHF range for aircraft flight following, for changes in mission requirements, and for assistance during emergencies. The AN/ARC-51 BX is an airtight assembly with the capability of providing 3500 channels of communication. Installation of the set has increased units' frequency availability by providing 3500 channels of operation compared to 1750 channels for the AN/VRC-24, and has increased the range over which communications can be maintained while decreasing the noise level. Radio set AN/ARC-51 BX has been installed in the unit tactical operations center to replace the AN/VRC-24 radio set. Construction of the wiring harness can be accomplished by an electronics repairman knowledgeable in soldering techniques and schematic diagram interpretation. Cost would include the difference in price between the ARC-51 BX and the VRC-24.

(3) Conclusions and Recommendations

(a) Conclusions

1. The substitution has overcome problems of range, noise, and reliability associated with use of the AN/VRC-24 for air-to-ground communication.

2. It has also provided an increased frequency availability for command and control communications between unit aircraft and flight operations.

3. The substitution is suitable for employment by aviation units which have radios aboard their aircraft.

(b) Recommendations

1. Within the TO&E's of the company and battalion flight operations facilities the AN/ARC-51 BX be substituted for the AN/VRC-24.

2. Necessary harness be developed to accomodate the above recommended substitution.

PRECEDING PAGE BLANK

8. CONSTRUCTION

a. Aircraft Revetments

(1) Purpose/Problem

To provide protection for parked aircraft from indirect fire. There are several different methods and materials with which to construct revetments. The availability of the materials and construction equipment determines the type of revetments used.

(2) Description/Discussion

Seven types of revetments have be observed. The following is a breakdown of advantages and disadvantages of each type.

(a) 55 gallon drums filled with dirt or concrete (see figure II-73). This is usually a temproary revetment, used until more permanent revetments are constructed. It is too low to provide ample protection to the upper part of the aircraft. In a single row of barrels, the area of least resistance to shrapnel is where the barrels meet. A double row of barrels would overcome this weakness.

(b) Warhead containers filled with dirt or concrete (see figure II-74). This is not a common type of revetment. Its height and length provides sufficient protection but the area between containers offers very little. A large supply of containers is also required for construction.

(c) Corrugated steel sheet supported with wood and filled with dirt (see figure II-75). A semi-permanent revetment, it affords good protection from enemy fire. Frequent maintenance is required as the wooden supports rot and the dirt fill escapes. It is a time consuming revetment to build.

(d) Pierced steel planking (PSP) filled with dirt (see figure II-76). A semi-permanent revetment, it affords good protection. The engineer stakes which are used to support the PSP must be driven far enough into the ground to remain in place during the rainy season. Engineer support is required for construction, and only minor maintenance is required for upkeep.

(e) PSP filled with concrete. A permanent revetment, it provides excellent protection. There is no maintenance required; however, engineer support is required for construction.

(f) Corrugated steel matting filled with concrete (see figure II-77). Most commonly found at Air Force locations, it affords excellent protection. A permanent revetment and maintenance free, it requires engineer support for construction.

(g) Preformed concrete slab with interlocking base blocks (see figure II-78). This is the only revetment noted which can be readily disassembled and moved. It provides excellent protection and is maintenance free. The slabs and base blocks are preformed at a central point and transported to the site for assembly. A crane is needed to position the sections.

(3) Conclusion and Recommendations

(a) Conclusion

While the revetments using concrete offer the best protection and are maintenance free, concrete and the necessary equipment to mix it must be available. The preformed concrete slab revetment is far superior since it is moveable, quickly assembled and maintenance free.

(b) Recommendations

1. The concrete slab with interlocking base block type revetment be installed wherever feasible.

2. Engineer support units be responsible for preforming the concrete slabs and base blocks and supervising the assembly of the revetment.

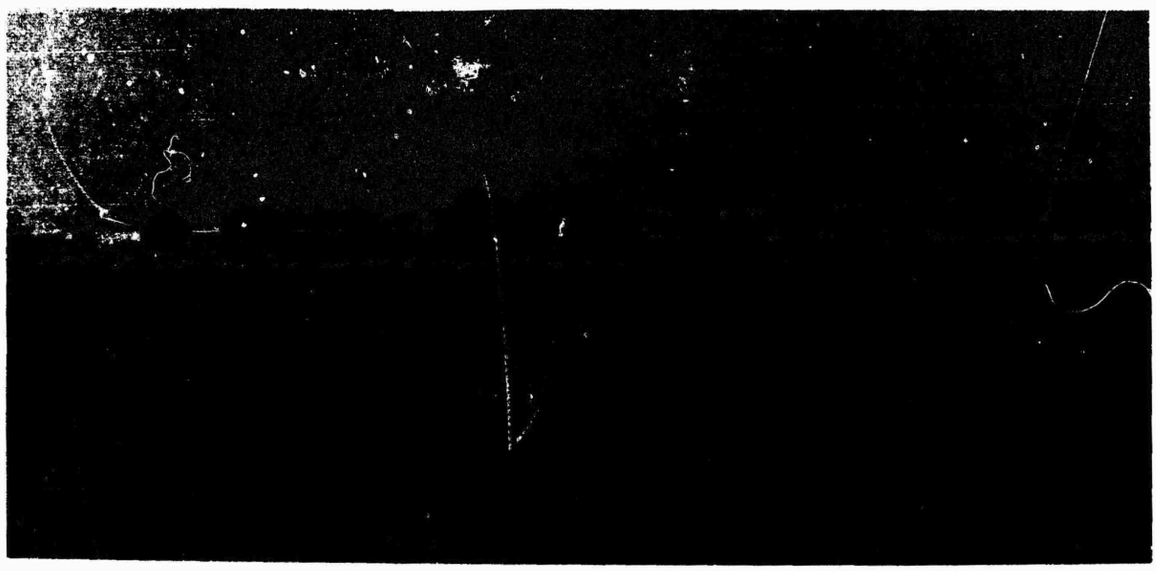


FIGURE II-73. Fifty-Five Gallon Drum Revetment.

FIGURE II-74. Warhead Container Revetment.

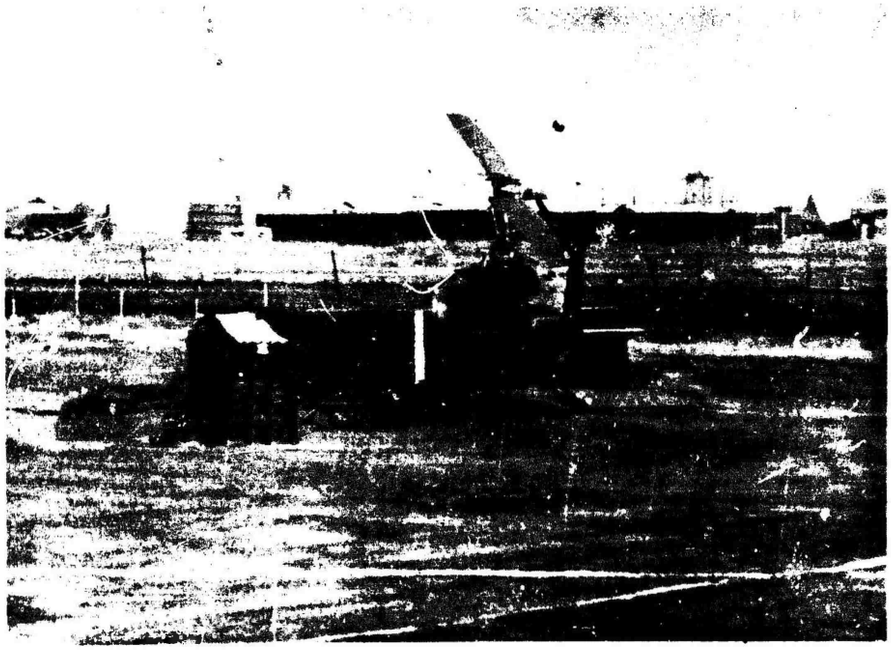


FIGURE II-75. Corrugated Steel Revetment.

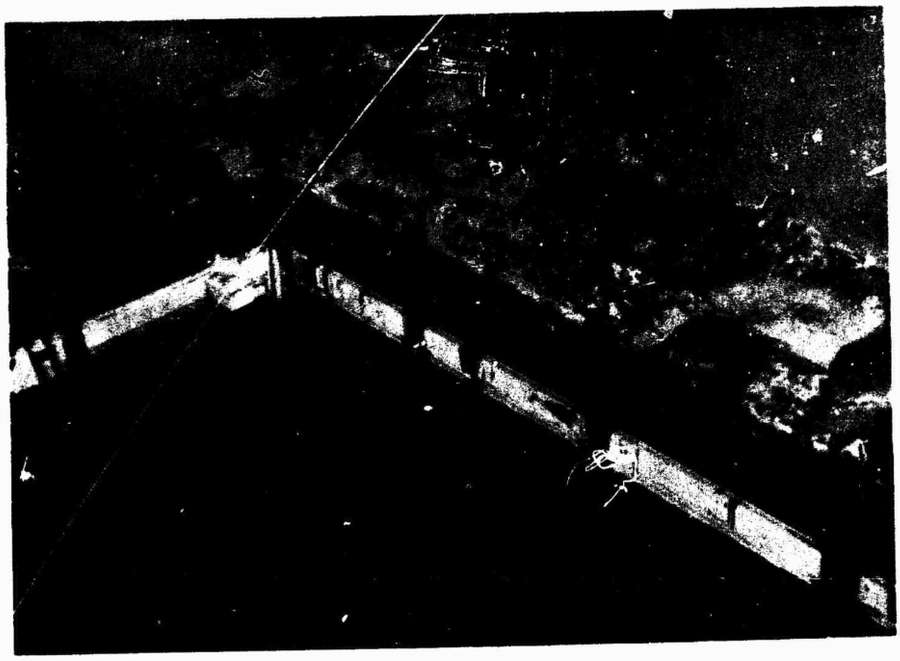


FIGURE II-76. PSP/Dirt Revetment.

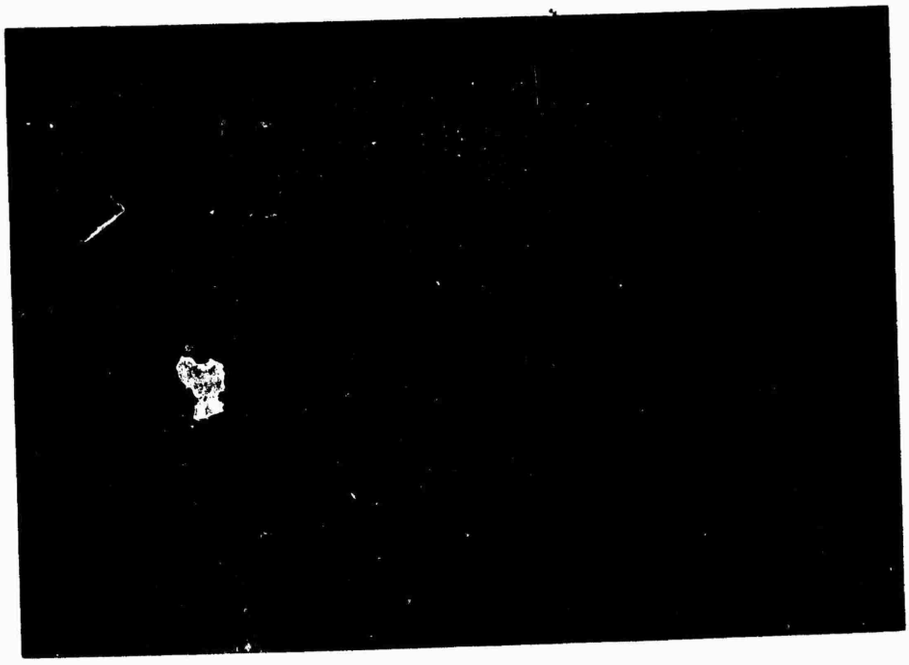


FIGURE II-77. PSP/Concrete Revetment.

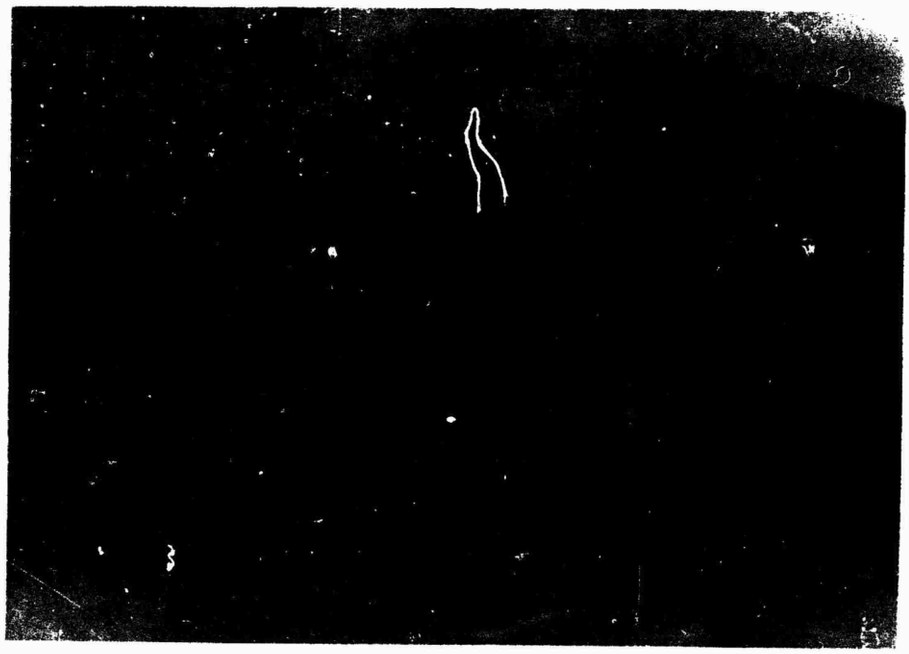


FIGURE II-78. Preformed Concrete Revetment.

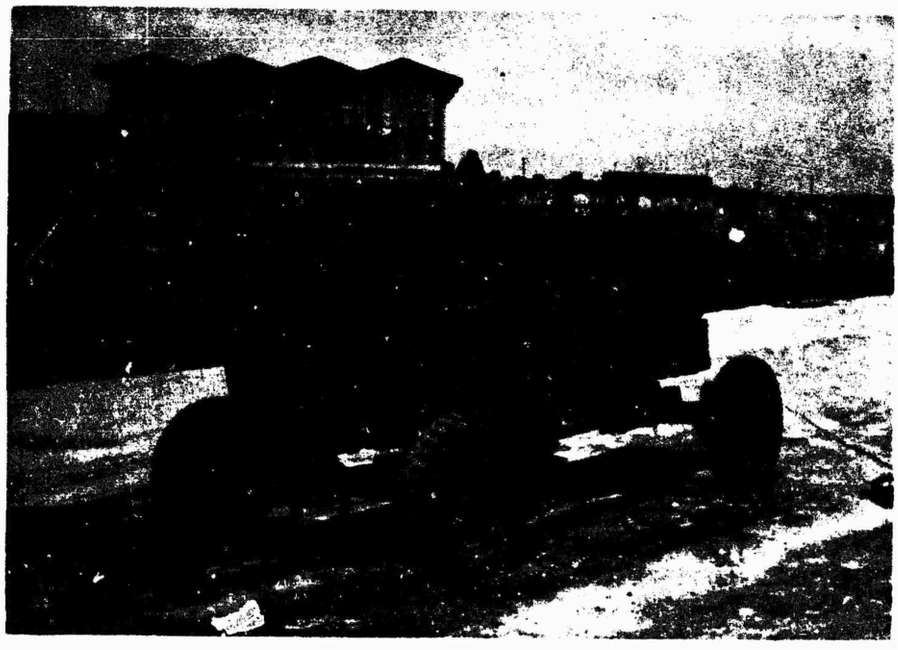


FIGURE II-79. Mobile Revetment

b. Mobile Revetment

(1) Purpose/Problem

The mobile revetment is positioned in front of helicopter gunships to protect the surrounding area from misfired ammunition, and to provide limited protection to the front of the aircraft from enemy shrapnel. The revetment is moved into position after the aircraft is parked. It can be moved by vehicle or by at least two men. This mobile revetment was developed by a unit which moves frequently to a new base of operations, and has neither the time nor space available to build permanent type revetments.

(2) Description/Discussion

The mobile revetment is constructed using readily available materials. Its length is 11'10", with height of 5' and depth of approximately 28". The wheeled base is formed by two dollies (FSN 7400052) welded together to form one rigid platform (see figure II-79). The dolly is issued with the mobile shop set common to all aviation units. It has a handbrake installed. On this platform are mounted 24 dirt-filled 2.75-inch rocket boxes. They are stacked four deep and three high the length of the platform. Two sheets of pierced steel planking (PSP) matting are mounted in back of the boxes for added rigidity and protection (see figure II-80). One disadvantage is the shortage of dollies in the event the shop sets must be moved.

(3) Conclusion and Recommendations

(a) Conclusion

1. The mobile revetment is valuable to units which move frequently, and lack time or space to construct permanent revetments.

2. In this configuration, the revetment is not long enough to provide protection alongside the aircraft.

(b) Recommendations

1. The concept of a mobile revetment be studied for further development.

2. This information be disseminated to all aviation units, but caution be exercised to use a different wheeled base to preclude rendering the mobile shop set dolly unserviceable.

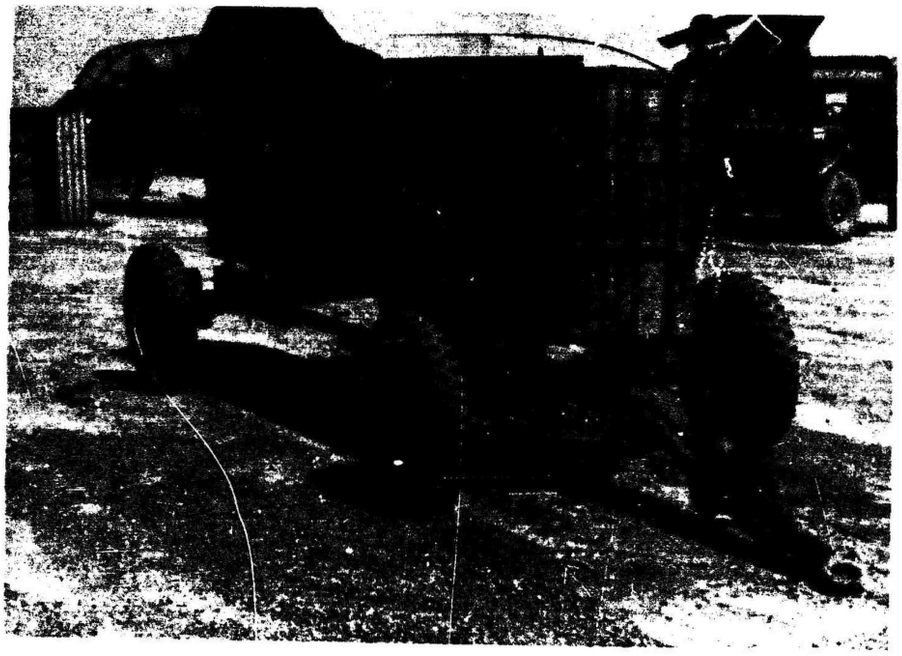


FIGURE II-79. Mobile Revetment.

FIGURE II-80. Mobile Revetment.

UNCLASSIFIED

Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY (Corporate author) Army Concept Team in Vietnam APO San Francisco 96384	2a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED 2b. GROUP

3. REPORT TITLE

Field Expedient Systems in Use By Army Aviation in RVN

4. DESCRIPTIVE NOTES (Type of report and inclusive dates)

Final Report - December 1970 - April 1971

5. AUTHOR(S) (First name, middle initial, last name)

6. REPORT DATE 30 September 1971	7a. TOTAL NO. OF PAGES 106	7b. NO. OF REFS 7
8a. CONTRACT OR GRANT NO. None b. PROJECT NO. c. d.	9a. ORIGINATOR'S REPORT NUMBER(S) ACTIV Project No. ACA 38F 9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report) None	

10. [redacted]RIBUTION STATEMENT

11. SUPPLEMENTARY NOTES None	12. SPONSORING MILITARY ACTIVITY USARV APO San Francisco 96375

13. ABSTRACT

During the period 16 December 1970 - 7 April 1971, the Army Concept Team in Vietnam conducted a study of aviation field expedients in use by Army aviation units in the Republic of Vietnam. Field expedients are any non-standard devices produced by a field unit for its own use to improve efficiency or mission performance. These range from weapon systems, special tools, and test sets to procedures that save time and manpower, improve mission performance, and provide the unit a capability that was not previously available.

The study was conducted to accumulate and document the experience of Army aviation units in the Republic of Vietnam, in the use of field expedients, and make recommendations for formal development or procurement of those items which contribute significantly to mission accomplishment, safety, or efficiency of operation. Field expedients of marginal value are also included in this report for the purpose of emphasizing areas where a deficiency exists in presently available equipment.

Conclusions and recommendations are included on individual field expedient reports.

DD FORM 1 NOV 68 1473 REPLACES DD FORM 1473, 1 JAN 64, WHICH IS OBSOLETE FOR ARMY USE.

UNCLASSIFIED

Security Classification

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Army Aviation						
Expedients						
Stability Operations						
Vietnam						